



CH2MHILL

169796

K.3
3/25/98

CH2M HILL

411 E. Wisconsin Avenue

Suite 1600

Milwaukee, WI

53202-4421

Mailing address:

P.O. Box 2090

Milwaukee, WI

53201-2090

Tel 414.272.2426

Fax 414.272.4408

March 25, 1998

143104.RP.03.09

Mr. Michael McAteer
Work Assignment Manager
U.S. EPA Region 5, HSRW-6J
77 West Jackson Blvd
Chicago, IL 60604-3590

Dear Mike:

Subject: Revised ECC QAPP/FSP

Attached is the revised QAPP/FSP for your review. The revisions were necessary to incorporate the revised 10% confirmatory sampling and to revise sample numbers based on a projection of 3 years of sampling (for the purposes of the current RAC Statement of Work). IDEM's "RISC" limits have also been incorporated into the document for the "Southern Concrete Area" removal action. The soil VOC method has also been changed from SW846-8240 to SW846-8260 because the SW846-8240 has been deleted from the list of promulgated methods.

I have highlighted the changes made in the QAPP for your review. The FSP is printed out in redline/strikeout mode. Please review these documents and provide feedback with any comments to me so that we can finalize these revisions.

Please feel free to call me with any questions or comments.

Sincerely,

CH2M HILL

Dong-Son Pham
Environmental Chemist

**QUALITY ASSURANCE PROJECT PLAN (QAPjP)
Remedial Action Oversight**

**Environmental Conservation and Chemical Corporation Site
Zionsville, Indiana**

**WA No. 008-ROBF-0530 / Contract No. 68-W8-0025
March 25, 1998
Revision 1**

QUALITY ASSURANCE PROJECT PLAN (QAPjP)
Remedial Action Oversight
Environmental Conservation and Chemical Corporation Site
Zionsville, Indiana
WA No. 008-ROBF-0530 / Contract 68-W8-0025

Prepared by: CH2M HILL

Date: March 25, 1998

Approved by:

USEPA, Region 5, Remedial Project Manager
Michael McAteer

USEPA, Region 5, Quality Assurance Reviewer

CH2M HILL Site Manager
Tim Harrison

CH2M HILL Quality Assurance Manager
John Fleissner

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List of Acronyms / Abbreviations

ARARs	Applicable or Relevant and Appropriate Requirements
BCRRS	Boon County Resource Recovery Systems, Inc.
BNA	Base-Neutral-Acid Extractables (Semivolatile Organics)
CLP	Contract Laboratory Program
DQO	Data Quality Objective
ECC	Environmental Conservation and Chemical Corporation
FSP	Field Sampling Plan
GFAA	Graphite Furnace Atomic Absorption
GC/MS	Gas Chromatography/Mass Spectrometry
IDEM	Indiana Department of Environmental Management
kg	Kilogram
L	Liter
MDL	Method Detection Limit
µg	Microgram
mg	Milligram
ND	Nondetect
NSL	Northside Sanitary Landfill
PCB	Polychlorinated Biphenyls
PRP	Potentially Responsible Part
QA	Quality Assurance
QAO	Quality Assurance Officer
QAP	Quality Assurance Plan
QAPjP	Quality Assurance Project Plan
QAU	Quality Assurance Unit
QC	Quality Control
RA	Remedial Action
RCRA	Resource conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RRA	Revised Remedial Action
SAS	Special Analytical Services
SM	Site Manager
SOP	Standard Operating Procedure
SOW	Statement of Work
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compound
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 Introduction

The United States Environmental Protection Agency (USEPA) requires that all environmental monitoring and measurement efforts mandated or supported by the USEPA participate in a centrally managed quality assurance (QA) program.

Any party generating data under this program has the responsibility to implement minimum procedures to assure that the precision, accuracy, completeness, and representativeness of its data are known and documented. So that the responsibility is met uniformly, each party must prepare a written QA Project Plan (QAPjP) covering each project it is to perform.

This QAPjP presents the organization, objectives, functional activities, and specific QA and quality control (QC) activities associated with revised Remedial Action (RA) activities in accordance with the revised Exhibit A to the Consent Decree (May 7, 1997) for the Environmental Conservation and Chemical Corporation (ECC) site, located in Zionsville, Indiana.

This QAPjP and associated Field Sampling Plan (FSP) located in Appendix A present the sampling and analysis QA/QC procedures for the co-located sampling which will be conducted by the USEPA during the ECC Remedial Action. The USEPA will conduct soil cleanup verification sampling to verify remedial action goals have been met by Soil Vapor Extraction (SVE). After soil cleanup verification has been achieved, the USEPA will participate in compliance monitoring which will be conducted for a period of 7 years. The USEPA will also participate in the establishment of background groundwater and surface water concentrations by collecting upgradient groundwater and upstream surface water and flow measurements over a 12-month period prior to the SVE system operation.

This QAPjP also describes the specific protocols that will be followed for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses.

All QA/QC procedures will be in accordance with applicable professional technical standards, USEPA requirements, government regulations and guidelines, and specific project goals and requirements. This QAPjP is prepared for USEPA Region 5 under Work Assignment No. 27-5P30, by CH2M HILL, in accordance with all USEPA QAPjP guidance documents, in particular, the Contract Laboratory Program (CLP) guidelines, *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80)*, and the *Region 5 Model QAPjP (Revision No. 1, 1996)*.

2.0 Project Description

2.1 Site Description and History

The ECC Site is located in Zionsville, Boone County, Indiana, approximately 10 miles northwest of Indianapolis (Figure 1-1). Directly west of the Site is an active commercial waste handling and recycling facility operated by the Boone County Resource Recovery Systems, Inc. (BCRRS). East of the site is the inactive Northside Sanitary Landfill (NSL) site which was a privately owned and operated solid waste disposal facility (Figure 1-2). This facility is also a Superfund Site and is presently completing remedial action activities. Residential properties are located within 1/2 mile of the site to the north and west.

Beginning in 1977, the ECC site was a 6.5-acre solvent recycling facility engaged in recovery, reclamation, and brokering of primary solvents, oils, and other wastes received from industrial clients. Waste materials were received in drums and bulk tankers and prepared for reclamation or disposal. Drum shipments to the site were halted in February 1982.

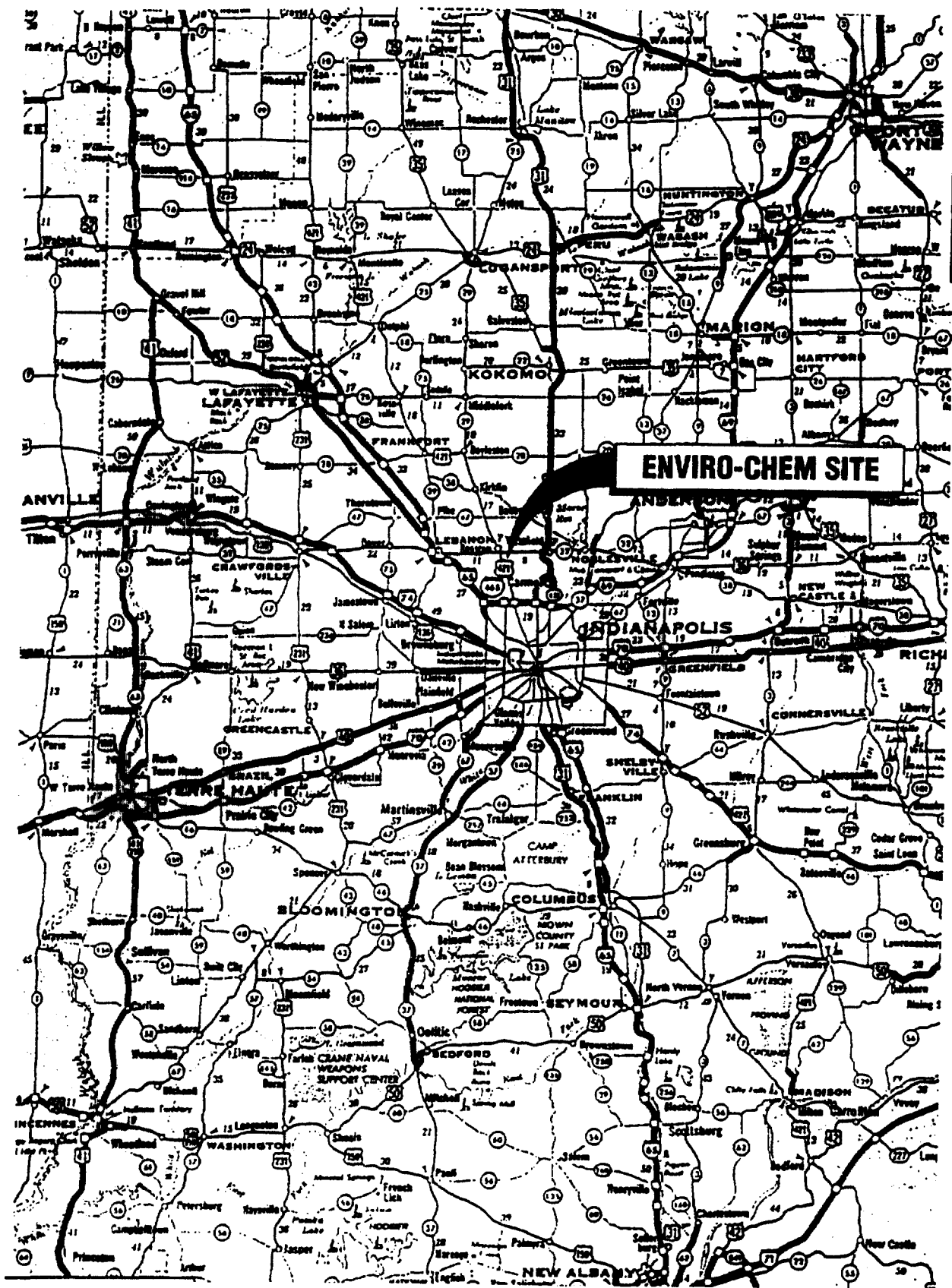
The USEPA investigated the site and placed it on the National Priorities List in 1983. Interim remedial action at the site, performed by the USEPA in 1983 and 1984, included cleanup of drums, containers, and a sludge lagoon and removal of certain contaminated soils. A Remedial Investigation/Feasibility Study (RI/FS) was conducted by CH2M HILL for the USEPA from 1983 through 1986.

2.1.1 Amended ROD and Consent Decree

The Record of Decision (ROD) for the site was published on September 25, 1987, and amended on June 7, 1991. The remedial action included in the original Exhibit A of the Consent Decree consisted of in situ soil vapor extraction (SVE), a Resource Conservation and Recovery Act -compliant Subtitle C cover (RCRA-compliant cover), access restrictions, and subsurface and surface water monitoring. The Consent Decree was signed by the USEPA, the State of Indiana, and a group of Potentially Responsible Parties (PRPs), and was entered in the U.S. District Court for the Southern District of Indiana on September 10, 1991.

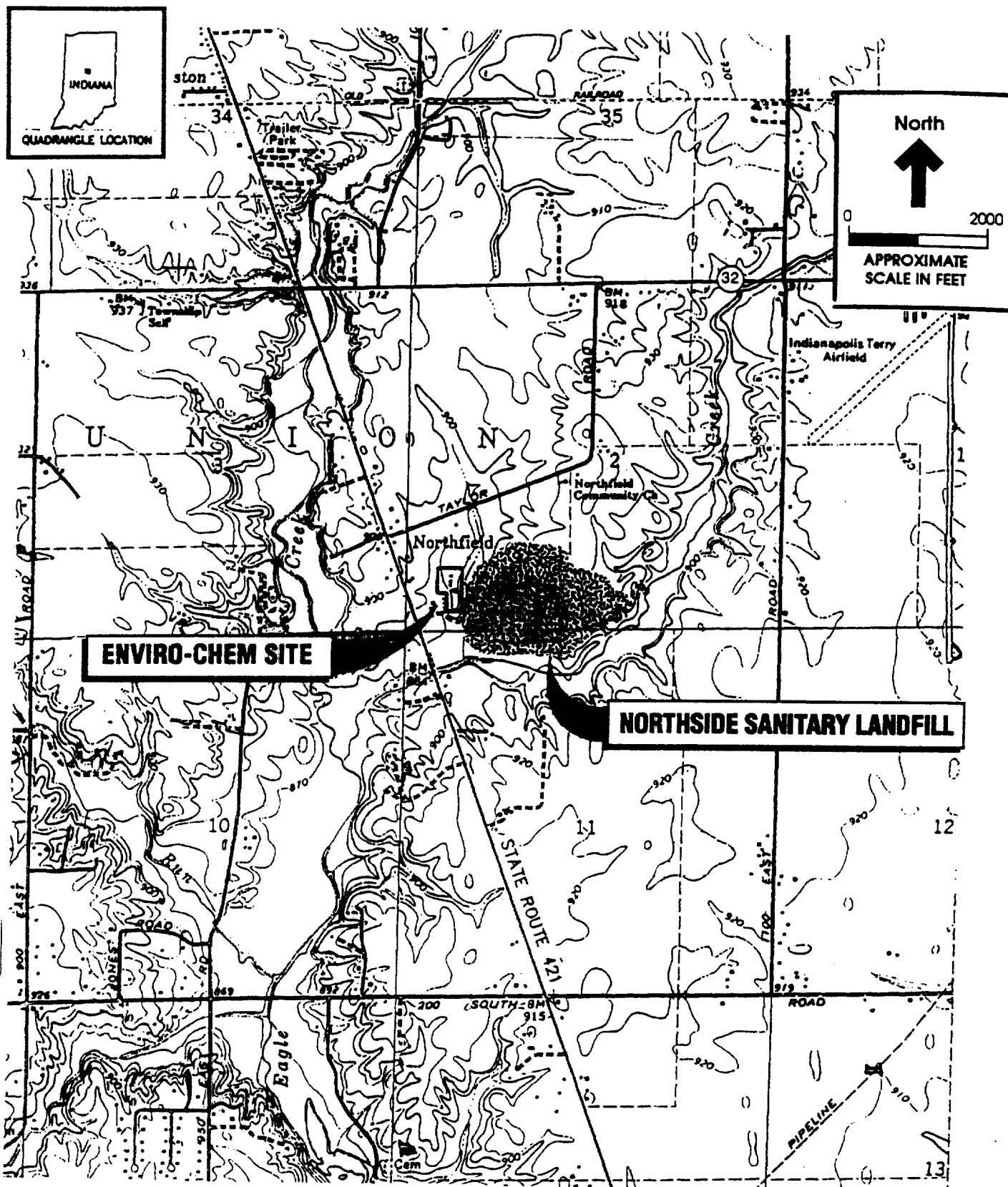
Exhibit A and the consent Decree were revised to reflect additional data obtained from supplemental site investigations and several engineering and operational modifications to the original remedial action. Revisions to the remedial action described in the original Exhibit A have been made, with USEPA's approval, in part because saturated conditions beneath the southern concrete pad would interfere with the implementation of in situ SVE in that area. The site conditions were better defined as a result of a number of reports, including the November 1994 Southern Concrete Pad Area Investigation Report.

The remedy presented in the original Exhibit A was modified to address the concrete slab and contaminated soils from the southern concrete pad area. The modification requires the



0 10
APPROXIMATE
SCALE IN MILES

FIGURE 1-1
Site Location Map
Enviro-Chem Superfund Site



Source: USGS 7.5 min. Quadrangle for Rosston, IN., Photorevised 1987.

FIGURE 1-2
Site Map
Enviro-Chem Superfund Site
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excavation and spreading of the concrete slab and contaminated soils from the southern concrete pad area onto the northern portion of the site for treatment by SVE rather than in situ SVE of the area. The excavated area will be backfilled with native soils. The revised Exhibit A and Consent Decree were approved by USEPA in June 1997.

2.2 Nature and Extent of Contamination

The contaminants detected in onsite soils during the RI include both inorganic (metals) and organic (VOCs, SVOCs, and PCBs) constituents (Table 2-1). Inorganic soil contamination is greatest in the near surface (0 to 3 feet) soil in the northern portions of the site. Metals do exist, although less widespread than observed in the overlying shallow soil. Primary organic contaminants found in onsite soils are volatile organic compounds (VOCs) and phthalates. These compound groups are the most widespread of the organic contaminants and are generally present at the highest concentrations. Organic contamination decreases both in the number of compounds found and in concentration with depth. Organic contaminants were detected to the maximum depth of sample analysis (8.5 feet).

Organic contaminants have been detected at high levels in onsite groundwater samples collected from the shallow saturated zone. The shallow aquifer has also been shown to be contaminated with inorganic and organic compounds in one offsite well. The deep confined aquifer below the site has not been found to be contaminated. There has been no indication that the contaminants have migrated offsite. Results of the residential well sampling do not indicate contamination of the nearest residential wells.

Surface water sampling results indicate that inorganic contamination of surface water does not appear to be occurring offsite in the vicinity of ECC. Inorganic sediment contamination in the vicinity of ECC is limited to lead in the unnamed ditch. Organic contamination of offsite surface water was found in Finley Creek near Highway 421. Organic contaminants consist almost entirely of chlorinated hydrocarbons and are consistent with the contaminants found in ECC soils. In addition, surface water ponded on the clay cap onsite was found to be contaminated with a variety of base/neutrals and volatile compounds.

2.3 Revised Remedial Action Objectives

The overall objectives of the remedial activities at the ECC Site are to:

- Extract, concentrate, and destroy organic compounds by using an in situ SVE system;
- Enhance the operation of the SVE system and minimize the migration of the compounds remaining in the soils by installing a low permeability cover; and
- Monitor the effectiveness of the remediation activities by collecting subsurface and surface water, soil, and vapor samples.

TABLE 2-1

Summary of Remedial Investigation Data⁽¹⁾

(Page 1 OF 3)

Parameter	Soil ⁽²⁾		Sediments		Subsurface Water		Offsite Surface Water	
	Minimum ⁽³⁾	Maximum ⁽³⁾	Minimum ⁽³⁾	Maximum ⁽³⁾	Minimum (µg/L)	Maximum (µg/L)	Minimum (µg/L)	Maximum (µg/L)
Volatiles								
Benzene					ND/4 J	9K		
Chlorobenzene	ND/360	360						
1,1,1-Trichloroethane	ND/3 J	1,100,000			ND/5 K	7	ND/6	120
1,1-Dichloroethane	ND/380 J	380 J			ND/51.2	96	ND/45	45
1,1,2-Trichloroethane	ND/14	550						
Chloroethane					ND/29	120	ND/12	12
Chloroform	ND/5 J	2,900			ND/3 JB	9 K		
1,1-Dichloroethene	ND/47	35,000 B			ND/6	10		
Trans-1,2-Dichloroethene	ND/9	120,000 B			ND/3 J	4,000	ND/6 d	330
Trans-1,3-Dichloropropene					ND/77.5	77.5		
Ethyl Benzene	ND/14	1,500,000			ND/3 J	9 K	ND/2 d	13 d
Methylene Chloride	ND/8	310,000	ND/6.1	9.1	ND/2 J	64	ND/3 d	86
Trichlorofluoromethane			ND	ND	ND	ND		
Tetrachloroethene	ND/5 J	650,000			ND/9 K	9 K	ND/5 d	29
Toluene	ND/6	2,000,000			ND/9 K	9 K	ND/6	82
Trichloroethene	ND/3 J	4,800,000 B			ND/3 J	28,000	ND/13	240
Vinyl Chloride	ND/7	7			ND/6	85.8	ND/10	11
Acetone	ND/16	650,000			ND/9 KB	15,030 B	ND/30	1,100
2-Butanone	ND/6 J	2,800,000			ND/9 K	26 B	ND/16	560
4-Methyl-2-Pentanone	ND/35 J	190,000						
Styrene					ND/5 K	5 K		
o-Xylene							ND	ND
Total Xylenes	ND/11	6,800,000			ND/9	12	ND/11	47
Acid Extractables								
p-Chloro-m-Cresol							ND/30 d,e	30 d,e
Phenol	ND/610	570,000					ND/92 e	92 e
2-Methylphenol	ND/340	340					ND/27 e	27 e
4-Methylphenol	ND/53,000	53,000					ND/89 e	120 e
Base/Neutrals								
1,2-Dichlorobenzene	ND/240	900,000						
Fluoranthene					ND/20 K	20 K		
Isophorone	ND/270	440,000			ND/20 K	20 K	ND/86 e	ND/240 e

TABLE 2-1

Summary of Remedial Investigation Data⁽¹⁾

(Page 2 OF 3)

Parameter	Soil ⁽²⁾		Sediments		Subsurface Water		Offsite Surface Water	
	Minimum ⁽³⁾	Maximum ⁽³⁾	Minimum ⁽³⁾	Maximum ⁽³⁾	Minimum (µg/L)	Maximum (µg/L)	Minimum (µg/L)	Maximum (µg/L)
Naphthalene	ND/640	180,000						
bis(2-Ethylhexyl)phthalate	ND/230	370,000	ND/912	912	ND/23 K	23 K	ND	ND
Butyl Benzyl Phthalate	ND/400 J	47,000						
Di-n-Butyl Phthalate	ND/53	8,200						
Di-n-Octyl Phthalate	ND/310	2,100					ND/17 d,e	17 d,e
Diethyl Phthalate	ND/1,200	9,000			ND/20 K	20 K		
Dimethyl Phthalate	ND/360 J	1,300						
Chrysene					ND/20 K	20 K		
Fluorene	ND/260	260						
Phenanthrene	ND/350	8,100						
Pyrene					ND/30	30		
2-Methylnaphthalene	ND/1,900	2,100						
PCB-1232	ND/340 C	540 C						
PCB-1260	ND/750	39,000						
Inorganics								
Aluminum	1,920	44,800	2,172	9,744	ND/[65]	61,500	ND/[69]a	3,050 a
Antimony	ND/42	42	ND	ND	ND/4	4	ND	ND
Arsenic	ND/[4.5]	20	ND	ND	ND/15	15	ND	ND
Barium	[27]	1,730	27	102	150	1,070	ND/[92]	180
Beryllium	ND/[.36]	[3.9]	ND/0.6	0.6	ND	ND	ND	ND
Cadmium	ND/2.9	27	1.3 c	2.3	ND	ND	ND	ND
Calcium	[2,500]*	1,260,000	N/A	N/A	70,240 E	161,100 E	N/A	N/A
Chromium	9.6	145*	4	13	ND/11	144	ND/15	15
Cobalt	[3.4]	[51]	ND/5.3	5.3	ND/80	80	ND	ND
Copper	[13]	167	7	23	ND/[16]	106	ND/[18]	[18]
Iron	11,900	147,000	8,598	18,696	[51]	105,000	[77]	4,460
Lead	4.5	432*	6.8	31.3	ND/6.5	102	ND	ND
Magnesium	[2,060]*	292,000	N/A	N/A	29,780 E	131,800 E	N/A	N/A
Manganese	158	6,870	161	499	ND/17	1,930	76	1,708
Mercury	ND	ND	ND/0.05	2.25	ND/0.2	0.4	ND/0.2 b	0.4 b
Nickel	[5.8]	37	ND/13	23	ND/[32]	176	ND/[21]	47
Potassium	ND/[905]	[10,500]	N/A	N/A	ND/[1195]	105,940	N/A	N/A
Selenium	ND	ND	ND	ND	ND/3	4	ND/6	6
Silver	ND/[3.3]	[3.8]	ND	ND	ND/14	33	ND/[9.2]	9.2

TABLE 2-1

Summary of Remedial Investigation Data⁽¹⁾
(Page 3 of 3)

Parameter	Soil ⁽²⁾		Sediments		Subsurface Water		Offsite Surface Water	
	Minimum ⁽³⁾	Maximum ⁽³⁾	Minimum ⁽³⁾	Maximum ⁽³⁾	Minimum (µg/L)	Maximum (µg/L)	Minimum (µg/L)	Maximum (µg/L)
Sodium	ND/[480]	[15,600]	N/A	N/A	10,060	380,700	N/A	N/A
Thallium	ND	ND	ND	ND	ND/0.4	0.4	ND	ND
Tin	ND/17	30	ND	ND	ND	ND	ND	ND
Vanadium	[15]	37	ND/23	23	ND	ND	ND	ND
Zinc	[38]	650*	ND/52	75	ND/11	276	ND/36 B	79 B
Cyanide	ND/0.8	4.4	ND/33	73	ND	ND	ND/0.005	0.013

⁽¹⁾ These data were obtained from the tables of analytical results presented in Section 4.0 of the RI Report by CH2M HILL, dated March 14, 1986.

⁽²⁾ The ranges given for soil are taken from the Phase II data only, since some soil was removed from the site after the Phase I analyses.

⁽³⁾ The units for the soil and sediment analyses are: Tg/kg for volatiles, acid extractables, base neutrals, and PCBs/pesticides results; and mg/kg for the inorganics results.

Key

* The duplicate analysis was not within control limits.

[] The value was less than the Contract Required Detection Limit.

B The analyte was found in the laboratory blank and in the sample, which indicates probable contamination.

C The identification of this polychlorinated biphenyl (PCB)/pesticide parameter has not been confirmed by gas chromatography/mass spectrometry (GC/MS).

J The value is estimated and occurs when the mass spectra data indicate the presence of a compound that meets the identification criteria and the result is less than the specified detection limit but greater than zero.

E The value is estimated or not reported because of the presence of interferences.

K The actual value, within the limits of the method, is less than the value given.

a There was a poor or marginal recovery of this spiked metal.

b This metal was also detected in the analysis of the field blank.

c This value should be regarded as a qualitative indication of the presence of these metals because the concentration is below the lowest quantitative standard.

d An estimated value.

e The Quality Assurance (QA) review identified the results as semiquantitative because the average surrogate recovery was < 40 percent.

ND The compound was not detected. A number after ND in the "Minimum" column is the lowest detected concentration of the compound. For example, "ND/6" means that the compound was not detected in some samples and that the lowest detected concentration was 6.

N/A The compound was not analyzed for.

A blank space in the table indicates that no analytical results were provided in the Remedial Investigation Report for that compound in that matrix. The compound was either not analyzed for or not detected.

CH2M HILL's RA scope of work, as requested by USEPA, includes the following:

- Oversight of all RA activities performed by the PRP's subcontractor. These activities include:
 - Excavation of the Southern Concrete Pad area and backfill with clean soils. Excavated materials will be placed over the northern part of the ECC site for treatment by vapor extraction;
 - Dewatering during construction and SVE system operations, and offsite disposal or onsite treatment and disposal of the wastewater;
 - Installation and operation of an in situ SVE system;
 - Installation of a final cover over the soil treatment area; and
 - Monitoring of vapor, soil, and subsurface and surface water to evaluate the effectiveness of the remedial action as both operational soil cleanup verification and post operations compliance monitoring.
- Sampling and analysis of soil samples for selected VOCs, phenol, and 1,2-dichlorobenzene as part of the Soil Cleanup Verification
- Confirmatory analysis (approximately 10 percent) of co-located surface and subsurface water for selected VOCs, BNAs, PCBs, and inorganics as part of the Soil Cleanup Verification and Compliance Monitoring

A detailed summary of sampling and analysis of soil and water samples is presented in the Field Sampling Plan (FSP) located in Appendix A. A summary of USEPA's sampling and analysis activities is presented in Table 2-2.

Analytical methods for sample analysis are presented in Table 2-3. Specific parameters to be analyzed for each matrix and their acceptable concentrations are listed in Tables 2-4 through 2-6.

2.4 Sample Network Design and Rationale

The soil, subsurface water, and surface water sample location rationale are described in detail in the FSP (Appendix A).

2.5 Parameters to be Tested and Frequency

Sample matrices, analytical parameters, analytical methods, and sample collection frequencies can be found in Tables 2-2 and 2-3. Table 2-7 provides a summary of sample quantity, container, preservative and packaging requirements.

TABLE 2-2
Sampling and Analysis Summary for USEPA RA Activities
 (Page 1 of 3)

Sample Matrix	Laboratory Parameters	Samples ⁽²⁾		
		Number of Locations	Frequency	Total ^(1,4)
Background Groundwater and Surface Water Sampling				
Till Well T5 and Sand/Gravel Well S1 (offsite)	VOCs	2	Once ⁽⁵⁾	2
	BNAs	2		2
	PCBs	2		2
	Chromium VI	2		2
	Tin	2		2
	Antimony	2		2
	Other Metals ⁽³⁾	2		2
	Cyanide	2		2
Surface Water Location SW-1 (Unnamed Ditch) and NSL-1 (Northside Sanitary Landfill Ditch) 2 locs ?	VOCs	1	Once ⁽⁶⁾	1
	BNAs	1		1
	PCBs	1		1
	Arsenic	1		1
	Chromium VI	1		1
	Lead	1		1
	Nickel	1		1
	Zinc	1		1
	Cyanide	1		1
	Soil Cleanup Verification Phase			
Onsite Groundwater ⁽²⁾ (4 Till Monitoring Wells —T1,T2,T3,T4) only on 2 wells	VOCs	1	Annually ⁽⁷⁾	3
	BNAs	1		3
	PCBs	1		3
	Chromium VI (Cr ⁺⁶)	1		3
	Tin	1		3
	Antimony	1		3
	Other Metals ⁽³⁾	1		3
	Cyanide	1		3
Soils	VOCs	69	Once ⁽⁸⁾	69
	Phenol	69		69
	1,2-Dichlorobenzene	69		69
Offsite Groundwater ⁽²⁾ (6 Till—T5,T6,T7,T8,T9,T10 and 4 Sand/Gravel—S1,S2,S3,S4) and ECC-MW-13 only on 2 wells	VOCs	1	Quarterly (Year 1) Semi-annually (Year 2) Quarterly (Years 3+) while SVE in operation ⁽⁹⁾	10
	BNAs	1		10
	PCBs	1		10
	Arsenic	1		10
	Chromium VI (Cr ⁺⁶)	1		10
	Lead	1		10
	Nickel	1		10
	Zinc	1		10
	Cyanide	1		10

TABLE 2-2
Sampling and Analysis Summary for USEPA RA Activities
 (Page 2 of 3)

Sample Matrix	Laboratory Parameters	Samples ⁽²⁾		
		Number of Locations	Frequency	Total ^(1,4)
Compliance Monitoring Phase				
Offsite Wells (6 Till T5,T6, T7,T8,T9,T10 and 4 Sand/Gravel—S1,S2,S3, S4) and ECC-MW-13 ⁽²⁾	VOCs	1	Semi-annually ^(a)	6
	BNAs	1		6
	PCBs	1		6
	Arsenic	1		6
	Chromium VI (Cr ⁺⁶)	1		6
	Lead	1		6
	Nickel	1		6
	Zinc	1		6
	Cyanide	1		6
Onsite Wells (4 Till—T1,T2,T3,T4) ⁽²⁾	VOCs	1	Annually ⁽¹⁰⁾	3
	BNAs	1		3
	PCBs	1		3
	Chromium VI (Cr ⁺⁶)	1		3
	Tin	1		3
	Antimony	1		3
	Other Metals ⁽³⁾	1		3
	Cyanide	1		3
Surface Water (up and downstream—unnamed ditch—SW-1 and SW-2 and NSL ditch—NSL-1)	VOCs	1	Annually ⁽¹¹⁾	3
	BNAs	1		3
	PCBs	1		3
	Arsenic	1		3
	Chromium VI (Cr ⁺⁶)	1		3
	Lead	1		3
	Nickel	1		3
	Zinc	1		3
	Cyanide	1		3

VOCs = Volatile Organic Compounds

BNAs = Base/Neutral/Acids

PCBs = Polychlorinated Biphenyls

⁽¹⁾ The number of samples shown assumes 3 years of SVE operation and 3 years of post remediation onsite and offsite monitoring, and do not represent potential requirements of resampling (e.g., additional soil samples if soils criterion is not met during the cleanup verification phase, and SVE must be restarted). Groundwater sampling may continue during the cleanup verification phase beyond 3 years if the SVE system is operating during such periods.

⁽²⁾ Both filtered and unfiltered groundwater sample volumes will be required.

⁽³⁾ Other Metals—arsenic, barium, beryllium, cadmium, lead, manganese, nickel, silver, vanadium, and zinc.

⁽⁴⁾ The total number of samples does not include QC samples. QC samples include trip blanks, field blanks, field duplicate, and matrix spike/matrix spike duplicate (MS/MSD) samples. The frequency of QC samples is discussed in Section 4.

TABLE 2-2
Sampling and Analysis Summary for USEPA RA Activities
 (Page 3 OF 3)

Sample Matrix	Laboratory Parameters	Samples ⁽²⁾		
		Number of Locations	Frequency	Total ^(1,4)
(5) The PRP's subcontractor will collect samples monthly for 12 months. CH2M Hill will collect co-located samples during one of the monthly sampling events.				
(6) The PRP's subcontractor will collect samples during 6 events over a period of 12 months. CH2M HILL will collect co-located samples at one sample location during one of the monthly sampling events.				
(7) The PRP's subcontractor will collect samples at all 4 locations prior to SVE startup, semi-annually during years 1 and 2, and quarterly thereafter (years 3+) while the SVE is in operation. CH2M HILL will collect co-located sample annually at one location.				
(8) Fifty-four soil samples are estimated to be collected from the northern SVE area. Fifteen soil samples are estimated to be collected from the southern concrete pad excavation area.				
(9) The PRP's subcontractor will collect samples at all 11 locations. CH2M HILL will collect co-located samples at one of the locations per sampling event.				
(10)The PRP's subcontractor will collect samples at all 4 locations semi-annually. CH2M HILL will collect co-located samples at one location on an annual basis.				
(11)The PRP's subcontractor will collect samples at all 3 locations semi-annually. CH2M HILL will collect co-located samples at one location on an annual basis.				

TABLE 2-3
Analytical Methods

Sample Type	Chemical Analysis ⁽¹⁾	Analytical Method ⁽²⁾
Soil Samples	VOCs 1,2-Dichlorobenzene Phenol	SW-846 Method 8260 CLP SOW OLM03.2 ⁽³⁾ CLP SOW OLM03.2 ⁽³⁾
Onsite Subsurface Water and Offsite (Background-Only) Subsurface Water Samples	VOCs BNAs PCBs Chromium VI (Cr ⁶) Tin Antimony Other Metals (includes Arsenic) Cyanide	CLP SOW OLC02.1-Modified ⁽⁴⁾ CLP SOW OLC02.1-Modified ⁽⁴⁾ CLP SOW OLC02.1-Modified ⁽⁴⁾ SW-846 Method 7195 or 7197 SW-846 Method 6010 USEPA Method 200.8 CLP SOW ILM04.0 CLP SOW ILM04.0
Offsite Surface Water and Subsurface Water Samples Compliance Monitoring	VOCs BNAs PCBs Chromium VI Arsenic Other Metals Cyanide	CLP SOW OLC02.1-Modified ⁽⁴⁾ CLP SOW OLM03.2 CLP SOW OLC02.1-Modified ⁽⁴⁾ SW-846 Method 7195 or 7197 USEPA Method 200.8 CLP SOW ILM04.0 CLP SOW ILM04.0-Modified ⁽⁴⁾
Offsite Background Subsurface Water (1st year only—if required) Samples	VOCs BNAs PCBs Chromium VI (Cr ⁶) Tin Arsenic, Antimony Other Metals Cyanide	CLP SOW OLC02.1-Modified ⁽⁴⁾ CLP SOW OLC02.1-Modified ⁽⁴⁾ CLP SOW OLC02.1-Modified ⁽⁴⁾ SW-846 Method 7195 or 7197 SW-846 Method 6010 USEPA Method 200.8 CLP SOW ILM04.0 CLP SOW ILM04.0—Modified ⁽⁴⁾

⁽¹⁾ The specific parameters to be analyzed for each matrix are listed in Tables 2-4 through 2-6.

⁽²⁾ CLP SOW = Contract Laboratory Program Statement of Work.

SW-846 = "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd Edition, December 1987. USEPA = "Determination of Trace Elements in Water and Waste by Inductively Coupled Plasma—Mass Spectroscopy," USEPA Method 200.8, August 1990.

⁽³⁾ The analysis will be conducted following the protocols in the CLP SOW OLM03.2 and corresponding revisions.

⁽⁴⁾ The corresponding CLP method will be modified by the laboratory to achieve detection limits lower than those specified in the method.

Key

VOCs = Volatile Organic Compounds

BNAs = Base Neutral/Acids

PCBs = Polychlorinated Biphenyls

TABLE 2-4
Acceptable Soil Concentrations⁽¹⁾

Parameter	Northern SVE Area Acceptable Soil Concentration⁽¹⁾ (µg/kg)	Southern Excavation Area IDEM Proposed Acceptable Soil Concentration⁽²⁾ (µg/kg)
Volatile Organic Compounds		
Acetone	2,196	3,090
1,1-Dichloroethene	762	57.9
1,2-Dichloroethene (total)	5,782	1,079
Ethyl Benzene	207,464	13,400
Methylene Chloride	126	23.1
Methyl Ethyl Ketone	352	11,400
Methyl Isobutyl Ketone	18,200	13,400
Tetrachloroethene	77	57.7
Toluene	546,134	11,700
1,1,1-Trichloroethane	47,871	1,930
1,1,2-Trichloroethane	71	30.4
Trichloroethene	812	57.0
Vinyl Chloride	8.3	13.5
Total Xylenes	5,596,192	1,292,000
Semi-Volatile Organic Compounds		
1,2-Dichlorobenzene	370,160	17,200
Phenol	51,680	113,000

⁽¹⁾ From Table 3-1 of Exhibit A to the Consent Decree.

⁽²⁾ IDEM "RISC" Limits per Vince Epps/IDEM Remedial Project Manager.

TABLE 2-5
Onsite Till Water Acceptable Subsurface Water Concentrations⁽¹⁾

Parameter	Acceptable Subsurface Water Concentration ⁽¹⁾ (µg/L)
Volatile Organic Compounds	
Acetone	3,500
1,1-Dichloroethene	7
1,2-Dichloroethene (total)	70
Ethyl Benzene	680
Methylene Chloride	4.7
Methyl Ethyl Ketone	170
Methyl Isobutyl Ketone	1,750
Tetrachloroethene	0.69
Toluene	2,000
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	0.61
Trichloroethene	5
Vinyl Chloride	2
Total Xylenes	10,000
Semi-Volatile Organic Compounds	
Bis(2-ethylhexyl)phthalate	2.5
Di-n-butyl Phthalate	3,500
1,2-Dichlorobenzene	600
Diethyl Phthalate	28,000
Isophorone	8.5
Naphthalene	14,000
Phenol	1,400
Inorganics⁽²⁾	
Antimony	14
Arsenic	50
Barium	1,000
Beryllium	4
Cadmium	10
Chromium VI	50
Lead	50
Manganese	7,000
Nickel	150
Silver	50
Tin	21,000
Vanadium	245
Zinc	7,000
Cyanide	154
Polychlorinated Biphenyls (PCBs)⁽³⁾	0.0045⁽³⁾

⁽¹⁾ From Table 3-1 of Exhibit A to the Consent Decree.

⁽²⁾ Dissolved, except for cyanide.

⁽³⁾ The Acceptable Subsurface Water Concentration shown is for the sum of all PCBs present.

TABLE 2-6
Offsite Subsurface Water and Surface Water
Acceptable Stream Concentrations⁽¹⁾

Parameter	Acceptable Stream Concentration⁽¹⁾ (µg/L)
Volatile Organic Compounds	
1,1-Dichloroethene	1.85
1,2-Dichloroethene (total)	1.85
Ethyl Benzene	3,820
Methylene Chloride	15.7
Tetrachloroethene	8.85
Toluene	3,400
1,1,1-Trichloroethane	5,280
1,1,2-Trichloroethane	41.8
Trichloroethene	80.7
Vinyl Chloride	525
Semi-Volatiles Organic Compounds	
Bis(2-ethylhexyl)phthalate	50,000
Di-n-butyl Phthalate	154,000
1,2-Dichlorobenzene	763
Diethyl Phthalate	52,100
Naphthalene	620
Phenol	570
Inorganics⁽²⁾	
Arsenic	0.0175
Chromium VI	11
Lead	10
Nickel	100
Zinc	47
Cyanide	5.2
Polychlorinated Biphenyls (PCBs)⁽³⁾	0.000079⁽³⁾

⁽¹⁾ From Table 3-1 of Exhibit A to the Consent Decree.

⁽²⁾ Dissolved (except for cyanide) for subsurface water.

⁽³⁾ The Acceptable Stream Concentration shown is for the sum of all PCBs present.

TABLE 2-7
Sample Containers, Preservatives, and Holding Times—ECC Site

Analysis	Container Type	Preservation and Storage Requirements	Maximum Holding Time
Soil- VOCs	Two 8-ounce glass jars ^(a)	4°C; protect from light	14 days
Soil- 1,2-Dichlorobenzene Phenol	Two 8-ounce glass jars ^(a)	4°C; protect from light	14/40 days ^(b)
Water- VOCs	Three 40-mL glass vials ^(a)	HCl to pH ≤ 2; 4°C; protect from light	14 days
Water- BNAs	Two 1-liter amber glass jars ^(a)	4°C; protect from light	7/40 days ^(b)
Water- PCBs	Two 1-liter amber glass jars ^(a)	4°C; protect from light	7/40 days ^(b)
Water- Metals	One 1-liter poly bottle ^(a)	HNO ₃ to pH ≤ 2; 4°C; protect from light	6 months (Mercury = 28 days)
Water- Chromium VI (CR +6)	One 1-liter poly bottle ^(a)	4°C; protect from light	24 hours
Water- Cyanide	One 500-mL poly bottle ^(a)	NaOH to pH > 12; 4°C	14 days

^(a) Teflon-lined cap or septa.

^(b) Days to extraction/days to analysis

2.6 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the data quality required to support decisions made during RA activities and are based on the end uses of the data to be collected. As such, different data uses may require different data quality levels. There are three analytical levels which address various data uses and the QA/QC effort and methods required to achieve the desired level of quality. These levels are:

Screening Data. This provides the lowest data quality but the most rapid results. It is often used for: (1) health and safety monitoring at the site, (2) preliminary comparison to ARARs, (3) initial site characterization to locate areas for subsequent and more accurate analyses, and (4) engineering screening of alternatives (bench-scale tests). These types of data include those generated onsite through the use of organic vapor monitors, and other real-time monitoring instruments used in the field.

Confirmational Data. This provides the highest level of data quality and is used for purposes of risk assessment, evaluation of remedial alternatives and PRP determination. These analyses require full Contract Laboratory Program (CLP) analytical and data validation procedures in accordance with EPA-recognized protocol.

Nonstandard Data. This refers to analyses by nonstandard protocols, for example, when exacting detection limits or analysis of an unusual chemical compound are required. These analyses often require method development or adaptation. These analyses require full CLP analytical and data validation procedures in accordance with EPA-recognized protocol.

A summary of the data to be collected, intended data uses, and DQO levels is provided in Table 2-8.

TABLE 2-8
Data Quality Objectives and Intended Data Uses

Data Collected	Data Quality Objective⁽¹⁾	Intended Data Use
Soil Samples - VOCs - Phenol - 1,2-Dichlorobenzene	Non-standard Confirmational Non-standard	Demonstrate compliance with the Soil Sample Criterion for Soil Cleanup Verification, as specified in Exhibit A to the Consent Decree.
Onsite Subsurface Water - VOCs - BNAs - PCBs - Tin - Cr VI - Antimony - Other Metals ⁽²⁾ - Cyanide	Confirmational Confirmational Confirmational Non-standard Non-standard Non-standard Confirmational Confirmational	(1) Demonstrate compliance with the Onsite Till Water Criterion for Soil Cleanup Verification, as specified in Section 4.2 of Exhibit A to the Consent Decree. (2) demonstrate the effectiveness of the remediation activities to minimize migration of parameters remaining in the soil after the soil vapor extraction is completed.
Offsite Subsurface Water - VOCs - BNAs - PCBs - Cr VI - Arsenic - Lead - Nickel - Zinc - Cyanide	Confirmational Confirmational Confirmational Non-standard Non-standard Confirmational Confirmational Confirmational Confirmational	(1) Demonstrate the effectiveness of the remediation activities to minimize migration of parameters remaining in the soil after the soil vapor extraction is completed. (2) determine the "Applicable Subsurface Water Background Concentrations," as described in Footnote 2 of Table 3-1 of Exhibit A to the Consent Decree.
Surface Water - VOCs - BNAs - PCBs - Cr VI - Arsenic - Lead - Nickel - Zinc - Cyanide	Confirmational Confirmational Confirmational Non-standard Non-standard Confirmational Confirmational Confirmational Confirmational	(1) Demonstrate the effectiveness of the remediation activities to minimize migration of parameters remaining in the soil after soil vapor extraction is completed. (2) determine the "Applicable Surface Water Background Concentrations," as described in Footnote 4 of Table 3-1 of Exhibit A to the Consent Decree.
Additional Offsite Background Subsurface Water from Investigative Upgradient Wells		
- VOCs - BNAs - PCBs - Cr VI - Arsenic - Lead - Nickel - Zinc - Cyanide	Confirmational Confirmational Confirmational Non-standard Non-standard Confirmational Confirmational Confirmational Confirmational	Determine the "Applicable Subsurface Water Background Concentrations," as described in Footnote 2 of Table 3-1 of Exhibit A to the Consent Decree.

TABLE 2-8
 Data Quality Objectives and Intended Data Uses

Data Collected	Data Quality Objective ⁽¹⁾	Intended Data Use
Additional Background Surface Water from Investigative Upstream Location.		Determine the "Applicable Surface Water Background Concentrations," as described in Footnote 4 of Table 3-1 of Exhibit A to the Consent Decree.
- VOCs	Confirmational	
- BNAs	Confirmational	
- PCBs	Confirmational	
- Cr VI	Non-standard	
- Arsenic	Non-standard	
- Lead	Confirmational	
- Nickel	Confirmational	
- Zinc	Confirmational	
- Cyanide	Confirmational	

⁽¹⁾Based on "Data Quality Objectives for Remedial Response Activities"—EPA 540/6-87/003, March 1987.

⁽²⁾Other Metals—arsenic, barium, beryllium, cadmium, lead, manganese, nickel, silver, vanadium, and zinc.

Key

VOCs = Volatile Organic Compounds

BNAs = Base/Neutral/Acid Extractable Compounds

PCBs = Polychlorinated Biphenyls

Cr VI = Chromium VI

QAPjP = Quality Assurance Project Plan

2.7 Project Schedule

A project schedule will be provided by the ECC Trust. The schedule will be updated as required.

3.0 Project Organization and Responsibility

The USEPA and IDEM will be responsible for the technical reviews associated with this RA. The ECC Trust will have the overall responsibility for implementing the remedial activities at the Site. At the direction of the EPA Region 5, CH2M HILL has responsibility for conducting oversight activities at the ECC site in Zionsville, Indiana during the RA. The various QA and management responsibilities of key project personnel are defined below and shown in Figure 3-1.

3.1 USEPA Region 5 Remedial Project Manager (RPM)

The RPM has the responsibility for overseeing the project and coordinating the USEPA and IDEM's review and approval of associated plans for the RA activities. The RPM is also responsible for the review and approval of this QAPjP. The RPM for the ECC site is Michael McAteer.

3.2 IDEM Remedial Project Manager

The IDEM RPM will be responsible for overseeing the project and for conducting all IDEM reviews of the remedial design and associated plans. The RPM for the ECC site is ~~Tony~~ Vince Eggs
Likins.

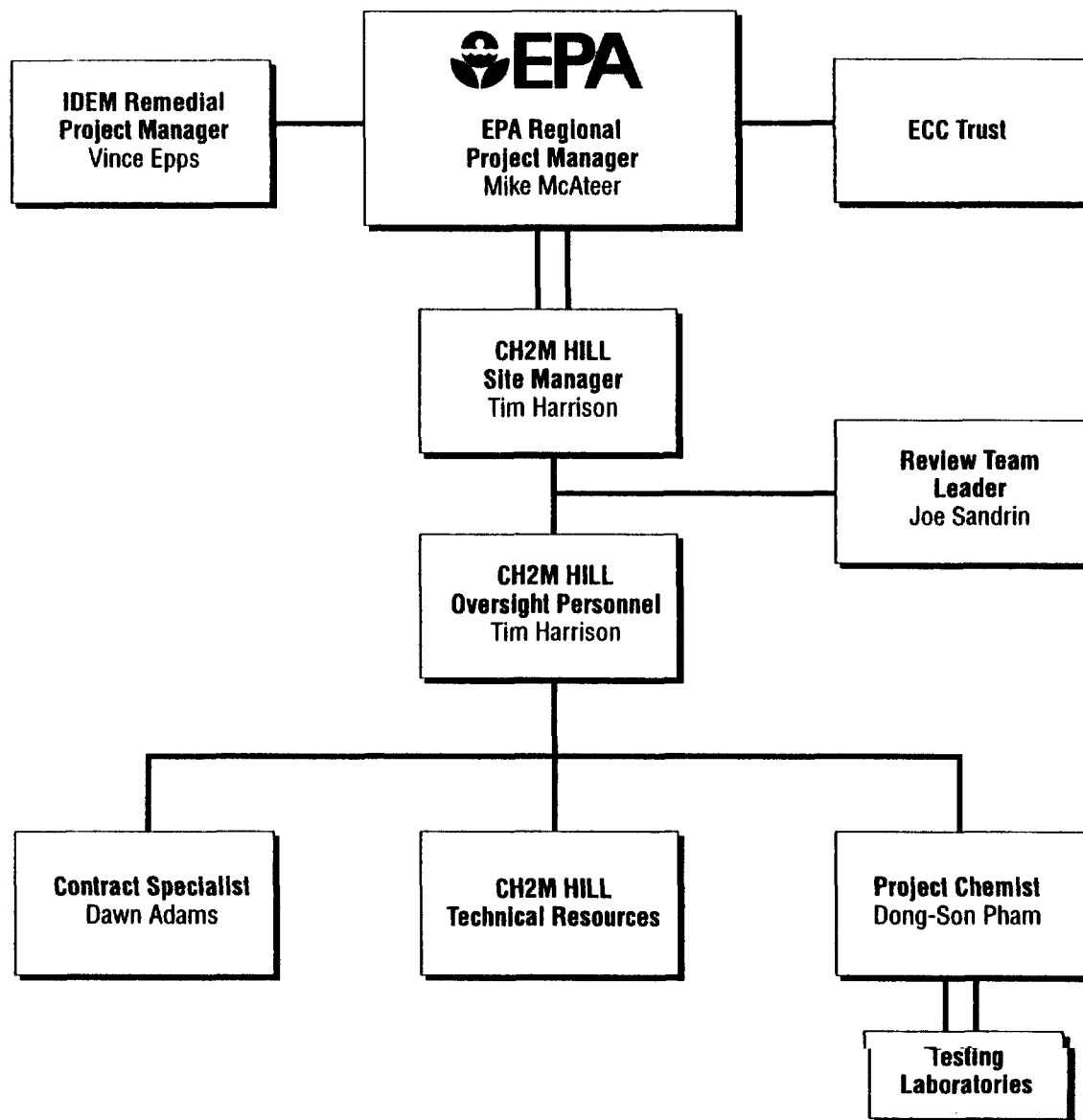
3.3 ECC Trust

The ECC Trust will have the overall responsibility for the implementation of the Remedial Action at the ECC Site. The ECC Trust and/or their designated ECC Trust's Engineer (Engineer) have the authority to commit the resources necessary to meet the project objectives and requirements.

The ECC Trust will: (1) provide the major point of contact with the USEPA and IDEM for matters concerning the project; (2) ensure that the project activities meet the requirements of the Consent Decree; and (3) approve all external reports (deliverables) before their submission to the agencies.

3.4 CH2M HILL Program Manager

The CH2M HILL Program Manager is Ike Johnson. He has overall responsibility for meeting EPA objectives and CH2M HILL quality standards. In addition, the Program Manager is responsible for technical QC and project oversight.



Relationships

== Contractual

— Functional

FIGURE 3-1
Project
Organization
Enviro-Chem Superfund Site

CH2MHILL

3.5 QA Manager

CH2M HILL's QA Manager is John Fleissner. The QA Manager will remain independent of direct job involvement and day-to-day operations and has direct access to management staff, as necessary, to resolve QA disputes. Specific functions and duties include the following:

- Provide QA review of various phases of the project, as necessary
- Review QA plans and procedures
- Provide QA technical assistance to project staff, as necessary

3.6 CH2M HILL Site Manager

The CH2M HILL Site Manager (SM) is Tim Harrison. The SM is responsible for implementing the project and is authorized to commit resources to meet project objectives and requirements. The SM's primary function is to achieve technical, financial, and scheduling objectives. The SM will report directly to the EPA Region 5 RPM and will be the major point of contact and control for matters concerning the project. More specifically, the SM will:

- Define project objectives and develop a detailed work plan and schedule
- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task
- Acquire and apply technical and corporate resources to meet budget and schedule constraints
- Orient field leaders and support staff with regard to the project's special considerations
- Monitor and direct other team members
- Develop and meet ongoing project or task staffing requirements, including mechanisms to review and evaluate each task product
- Review the work performed on each task to ensure quality, responsiveness, and timeliness
- Review and analyze overall task performance with regard to planned schedule and budget
- Review external reports (deliverables) before submission to EPA Region 5
- Accept responsibility for the preparation and quality of interim and final reports
- Represent the project team at meetings and public hearings

The CH2M HILL Assistant Site Manager (ASM) is Bill Andrae. With approval from the USEPA RPM, the ASM may be delegated to be in charge of some or all of these tasks.

3.7 CH2M HILL Review Team Leader

The Review Team Leader is Joe Sandrin. The role of the Review Team Leader is to support the SM in site management activities and to act as the coordinator of CH2M HILL internal reviews. The Review Team Leader will also be involved in the planning activities conducted at the beginning and during the project.

3.8 CH2M HILL Project Chemist

Dong-Son Pham is the Project Chemist. He will be responsible for tracking data and overseeing the data evaluation. Specific responsibilities include the following:

- Schedule the analytical laboratories
- Oversee the tracking of samples and data from the time of field collection until results are entered into a database
- Coordinate activities with laboratories and data validators
- Oversee data validation and production of result tables
- Evaluate data usability

3.9 CH2M HILL Contract Specialist

Dawn Adams is CH2M HILL's ARCS Program APM-ADMIN. She will be responsible for the contract documents created in support of RA activities. Specific responsibilities include the following:

- Contracting the analytical laboratories
- Contracting the subcontractors
- Resolving any contract disputes

3.10 CH2M HILL Technical Resources

The technical resources for this project will be drawn from CH2M HILL's corporate resources. The technical resources will be used to gather and analyze data and to prepare various task reports and support materials.

3.11 USEPA Region V Quality Assurance Officer

The USEPA Region V QAO will have the responsibility of reviewing and approving all QAPjPs.

3.12 Subcontract Laboratories' Project Managers

The analyses to be performed by laboratory subcontractors are listed in Table 2-2. The laboratories will be selected by the CH2M HILL and will be approved by the USEPA/IDEM. The laboratories' Project Managers will be responsible for coordinating and scheduling the laboratory analyses; supervising the in-house chain-of-custody; accepting requirements outlined within this QAPjP; and overseeing the data review and preparation of the analytical reports.

3.13 Subcontract Laboratories' Quality Assurance Officers

The laboratories' QAOs will be responsible for overseeing the laboratory QA and the analytical results QA/QC documentation, conducting the data review, selecting any necessary laboratory corrective actions, adherence to applicable in-house SOPs, adherence to the QAPjP, and approving the final analytical reports. Each laboratory may have more than one QAO if, for example, any of these various activities take place in different departments within the laboratory.

4.0 Quality Assurance Objectives for Measurement Data

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results that are legally defensible in a court of law. Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, data reporting, internal QC audits, field equipment preventive maintenance, and corrective action are described in other sections of this QAPjP. The purpose of this section is to address the specific objectives for accuracy, precision, completeness, representativeness, and comparability.

4.1 Level of Quality Control Effort

Field blanks, trip blanks, duplicates, and MS/MSD samples will be analyzed to assess the data quality resulting from the field sampling program.

Field and trip blanks consisting of HPLC-grade water will be submitted to the analytical laboratories. Field blank samples are analyzed to check for procedural contamination at the site. One water field blank will be collected and analyzed for every 10 or fewer investigative samples, whichever is greater. Trip blanks are used to assess the potential for contamination of samples during shipment and storage. One VOC trip blank will be included along with each shipping container of aqueous VOC samples. Duplicate soil and water samples will be collected every 10 field samples to check for sampling and analytical reproducibility.

MS/MSD sample provide information about the effect of the sample matrix on the measurement methodology. One MS/MSD sample will be collected for every 20 or fewer investigative samples.

The RA soil and water samples will be sent to a qualified laboratory for analysis. Table 2-2 contains the analytical parameters to analyze for. Table 4-1 contains the detection and reporting limits for the organic and inorganic compounds.

The level of QC effort provided by the laboratory will be as specified in Section 2 of this QAPjP, and in the method contract scope of work.

TABLE 4-1
 Project Required Detection Limits—ECC Site (1)

Project-Required Detection Limits (2)			
Laboratory Parameter	Soil (3,4) (µg/kg)	Onsite Till Water (µg/L)	Offsite Subsurface Water and Surface Water (µg/L)
Volatile Organics			
Acetone	10	5	NA
1,1-Dichloroethene	5	1	1
1,2-Dichloroethene (total)	10	1	1
Ethyl Benzene	5	1	1
Methylene Chloride	10	2	2
Methyl Ethyl Ketone	10	5	NA
Methyl Isobutyl Ketone	15	5	NA
Tetrachloroethene	5	0.6(5)	0.6(5)
Toluene	5	1	1
1,1,1-Trichloroethane	5	1	1
1,1,2-Trichloroethane	5	0.4(5)	0.4(5)
Trichloroethene	5	1	1
Total Xylenes	5	1	NA
Vinyl Chloride	5	1	1
Base Neutral/Acid Organics			
Bis(2-ethylhexyl)phthalate	NA	1.3(5)	10
Di-n-Butyl Phthalate	NA	10	10
1,2-Dichlorobenzene	330	10	10
Diethyl Phthalate	NA	10	10
Isophorone	NA	1.3(5)	NA
Naphthalene	NA	10	10
Phenol	330	10	10
Inorganics			
Antimony	NA	0.2	NA

TABLE 4-1
 Project Required Detection Limits—ECC Site (1)

Project-Required Detection Limits (2)			
Laboratory Parameter	Soil (3,4) (µg/kg)	Onsite Till Water (µg/L)	Offsite Subsurface Water and Surface Water (µg/L)
Arsenic	NA	10	0.0175 ⁽⁶⁾
Barium	NA	200	NA
Beryllium	NA	2 ⁽⁵⁾	NA
Cadmium	NA	5	NA
Chromium VI	NA	10	10
Cyanide	NA	10	2 ⁽⁵⁾
Lead	NA	3	3
Manganese	NA	15	NA
Nickel	NA	40	40
Silver	NA	10	NA
Tin	NA	200	NA
Vanadium	NA	50	NA
Zinc	NA	20	20
Polychlorinated Biphenyls (PCBs)	NA	0.5 ⁽⁶⁾	0.5 ⁽⁶⁾

- (1) Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.
- (2) Based on acceptable limits from Table 3-1 of Exhibit A to the Consent Decree.
- (3) The detection limits listed for soil are based on wet weight. The detection limits calculated by the laboratory for soil, on a dry weight basis as required by the contract, will be higher.
- (4) The detection limits shown for base neutral/acid organics are for low concentration soil samples. The medium concentration soil detection limits are 30 times the individual low concentration soil detection limit shown in the table.
- (5) These values are lower than the Contract Required Quantitation Limits specified in the Contract Laboratory Program (CLP) Statement of Work (SOW) being used for this analysis. However, lower detection limits have been achieved for these parameters during their method detection limit (MDL) study for this SOW. The laboratory shall submit a current MDL study to demonstrate the ability to meet the project-required detection limits. In addition, a standard at or below the level of the project-required detection limit must be analyzed by the laboratory during sample analysis.
- (6) The methodology for PCBs with the lowest practical detection limit at the time of sampling should be utilized.

4.2 Accuracy, Precision, and Sensitivity of Analysis

The fundamental QA objective with respect to accuracy, precision, and sensitivity of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols.

The accuracy, precision, and sensitivity requirements for non-CLP analytical services are specified in each individual request contained in Appendix B.

4.3 Completeness, Representativeness and Comparability

4.3.1 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the selected analytical laboratory will provide data meeting QC acceptance criteria for 90 percent or more for all samples analyzed.

Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{completeness (\%)} = \frac{(\text{number of valid data})}{(\text{number of samples collected for each parameter analyzed})} \times 100$$

The data generated that is of acceptable quality will be used regardless of whether the 90-percent QC acceptance goal is achieved.

4.3.2 Representativeness

Representativeness expresses the degree to which data precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the proper design of the sampling program and proper laboratory protocol. The rationale of the sampling network is discussed in detail in the FSP (see Appendix A). Representativeness will be satisfied by following the FSP, such that proper sampling technique(s) are used, proper analytical procedures are followed, and holding times for the samples are not exceeded in the laboratory. Representativeness will also be assessed by field-duplicated samples analysis.

4.3.3 Comparability

Comparability expresses the confidence with which one data set can be compared with another. The extent to which planned analytical data will be comparable to future analytical data depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in the QAPjP, are expected to provide comparable data.

5.0 Sampling Procedures

A FSP has been prepared and is attached as Appendix A. The FSP contains sampling procedures and includes the following:

- Detailed procedures for the collection of samples for the required parameters
- Detailed procedures for sample packaging, handling, and shipment
- Detailed procedures for collection of QC samples
- Documentation requirements of sampling activities (use of field log books, field measurement forms, etc.)

Refer to Table 2-2 for a summary of the sampling and analysis program and Table 2-7 for summaries of sample quantity, container, and packaging requirements. Appendix C contains detailed procedures for sample packaging, handling and shipment.

6.0 Sample Custody

It is USEPA and Region 5 policy to follow the USEPA Region 5 sample custody, or chain-of-custody protocols as described in "NEIC Policies and Procedures," EPA-330/9-78DDI-R, revised June 1985. Chain-of-custody involves three parts: sample collection, laboratory analysis and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is under your custody if it:

- Is in your possession
- Is in your view, after being in your possession
- Is in your possession and you place them in a secured location, or is in a designated secure area

6.1 Field Chain-of-Custody Procedures

The sample packaging and shipment procedures summarized below will be followed so that the samples will arrive at the laboratory with the chain-of-custody intact. The protocol for specific sample numbering and other sample designations are included in Section 4 of the FSP (Appendix A), and in Appendix C, Sample Shipment Documentation.

6.1.1 Field Procedures

The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched. As few people as possible should handle the samples.

- All sample containers are to be labeled with sample numbers and locations.
- Sample labels and tags are to be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample tag because the ballpoint pen would not function in freezing weather.
- The SM is to review all field activities to determine whether proper custody procedures were followed during the fieldwork and decide if additional samples are required. The SM will notify the USEPA RPM if a breach or irregularity in chain-of-custody procedures occurs.

6.1.2 Field Logbooks/Documentation

Data collection activities performed are to be recorded in a field logbook. Activities will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the document control center when not in use. Each logbook will be identified by the project-specific document number.

The title page of each logbook will contain the following:

- Person to whom the logbook is assigned
- Logbook number
- Project name
- Project start date
- End date

Logbook entries will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry will be entered. The names of site visitors, field sampling or investigation team personnel, and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. Entries will be made in ink and no erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark, initialed, and dated. Whenever a sample is collected or a measurement is made, a detailed description of the location of the station, including compass and distance measurements, shall be recorded. The number of the photographs taken of the station, if any, will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected following the sampling procedures documented in the FSP and subsequent appendices. The equipment used to collect samples will be noted, along with the time of sampling, sample description, sample location, and volume and number of containers. A sample identification number will be assigned before sample collection. Collocated and field blank samples, which will receive an entirely separate sample identification number, will be noted under the sample description.

6.1.3 Transfer of Custody and Shipment Procedures

- Samples will be accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of sample custody from the sampler to another person, to the permanent laboratory, or to/from a secure storage area.
- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be closed and secured with strapping tape and EPA custody seals for shipment to the laboratory. The preferred procedure includes use of a custody seal attached to the front right and back left of the cooler. The custody seals

are to be covered with clear plastic tape. The cooler is to be strapped shut with strapping tape in at least two locations.

- Whenever samples are collocated with a source or government agency, a separate sample receipt is prepared for those samples and marked to indicate with whom the samples are being collocated. The person relinquishing the samples to the facility or agency should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this is noted in the "Received By" space of the custody form.
- All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and the pink and yellow copies will be retained by the sampler for returning to the sampling office.
- If the samples are sent by common carrier, a bill of lading should be used. Bills of lading receipts will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carries are not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact.

6.2 Laboratory Chain-of-custody Procedures

The chain-of-custody procedures for the analytical laboratory(ies) are discussed in the laboratory's Quality Assurance Plan (QAP).

6.3 Final Data Files Custody Procedures

CH2M HILL is the custodian of the data files and will maintain the data files. Included in the data files are all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, correspondence, laboratory logbooks, chain-of-custody forms, analytical data, and any other pertinent records stored in a secured, limited access area and under custody of the SM.

7.0 Calibration Procedures and Frequency

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment that are used for conducting field tests and laboratory analyses. These instruments and equipment should be calibrated prior to each use or on a scheduled, periodic basis.

7.1 Field Instruments/Equipment

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications.

Equipment to be used during the field sampling will be examined to check that it is operating properly. This includes checking the manufacturer's operating manual and the instructions for each instrument to check that the maintenance requirements are being observed. Field notes from previous sampling trips will be reviewed so that notations on prior equipment problems are not overlooked and to check that all necessary repairs to equipment have been carried out.

Calibration of field instruments will be performed at the intervals specified by the manufacturer or more frequently as conditions dictate.

In the event that an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service.

7.2 Laboratory Instruments

Calibration procedures for the laboratory equipment will be as specified in the analytical methods scopes of work. Records of calibration, repairs, or replacement will be filed and maintained by the designated laboratory personnel performing QC activities. These records will be filed at the location where the work is performed and will be subject to QA audit.

Calibration of laboratory equipment will be based on approved written procedures. Calibration, repairs, or replacement records will be filed and maintained by the designated laboratory personnel performing quality control activities. These records will be filed at the location where the work is performed and will be subject to QA audit. For all instruments, the laboratory will maintain a factory-trained repair staff with in-house spare parts or will maintain service contracts with vendors.

The records of calibration will be kept as follows:

- If possible, each instrument will have record of calibration permanently affixed with an assigned record number.

- A label will be affixed to each instrument showing description, manufacturer, model numbers, last calibration date, by whom calibrated (signature), and due date of next calibration reports. Compensation or correction figures will be maintained with the instrument.
- A written stepwise calibration procedure will be available for each piece of test and measurement equipment.
- Any instrument that is not calibrated to the manufacturer's original specification, will display a warning tag to alert that analyst that the device carrier is only a "Limited Calibration."

8.0 Analytical Procedures

All water and soil samples collected during field sampling activities for the ECC RA sampling activities will be analyzed through non-CLP analytical services at laboratories to be identified later.

The analytical procedures to be used for performing the non-CLP analyses are described in the requests for non-CLP analytical services in Appendix B of this QAPjP. Also specified in the non-CLP analytical requests are calibration procedures, calibration frequency, and the internal quality control checks required for each analysis. A laboratory(ies) will be selected to provide required analytical support.

Each procedure is developed in the same manner from its method, as were the CLP Statements of Work (SOWs) from their basic methods. Each specifies:

- Procedures for sample preparation
- Instrument startup and performance check
- Procedures to establish the actual and required detection limits for each parameter
- Initial and continuing calibration check requirements
- Specific methods for each sample matrix type
- Required analyses and QC acceptance limits for method blanks, trip blanks (as appropriate), field blanks, matrix spikes, matrix spike duplicates, and laboratory control samples (USEPA or National Bureau of Standards (NBS) reference samples or laboratory prepared blank/spikes).

Table 2-3 summarizes the analyte group and method from which each SOP is derived, for chemical analyses.

9.0 Internal QC Checks

9.1 Laboratory Analysis

A QA program and QC checks will be employed by the analytical laboratory(ies) selected to perform the confirmatory analyses to ensure the production of analytical data of known and documented usable quality.

9.1.1 QA Program

The laboratory(ies) selected to perform these analyses will have a written Quality Assurance Plan (QAP). The QAP provides guidelines to ensure the reliability and validity of work conducted at the laboratory. Compliance with the QAP is coordinated and monitored by the laboratory's QA unit (QAU). The QAU acts independently of the operating departments and reports directly to the laboratory manager.

The objectives of the laboratory QAP are to:

- Ensure that all procedures are documented, including any changes in administrative and/or technical procedures.
- Ensure that all analytical procedures are conducted according to sound scientific principles and have been validated.
- Monitor the laboratory performance by a systematic inspection program and provide for a corrective action as necessary.
- Ensure that all data are properly recorded and archived.

9.2.1 QC Checks

The selected laboratories will perform the analyses according to the SOPs and requirements specified in the non-CLP analytical services requests.

The laboratory will document, in each data package provided, that both initial and ongoing instrument and analytical QC functions have been met. Any samples analyzed in nonconformance with the QC criteria will either be reanalyzed by the laboratory or duly noted as to the quality of the analytical result.

10.0 Data Reduction, Validation, and Reporting

10.1 Data Reduction

10.1.1 Laboratory Services

The samples collected at the ECC Site will be sent to a qualified laboratory. Data review, reduction and result reporting will be performed by this laboratory in accordance with the requirements of their QAP. The data will then be sent to CH2M HILL for data validation.

10.2 Data Validation

10.2.1 Laboratory Data Validation

The analytical laboratory data validation will be performed by USEPA following *National Functional Guidelines for Data Validation*. Validation will be accomplished by comparing the contents of the data packages and QA/QC results to the requirements specified in the analytical methods, the non-CLP Special Analytical Services (SAS) request forms, and the QAPjP. Raw data such as gas chromatography/mass spectrometry (GC/MS) total ion current (TIC) chromatograms or GC chromatograms, flame atomic absorption (FAA) data reports, and data station printouts will be examined to ensure that reported results are accurate and complete.

10.3 Data Reporting

10.3.1 Laboratory Data Reporting

The analytical laboratory will prepare and submit full analytical reports to CH2M HILL in compliance with requirements of the laboratory subcontract. The laboratory will report the data in the same chronological order in which it was analyzed. The laboratory will provide, at a minimum, the following information:

- Cover sheets listing the samples included in the report and comments describing problems encountered in analysis.
- Tabulated results of inorganic and organic compounds identified and quantified.
- Analytical results for QC sample spikes, sample duplicates, initial and continuous calibration verifications, blank results, and laboratory control sample results.
- Tabulation of instrument detection limits.

- Raw data system printouts (or legible photocopies) identifying date of analyses, analyst, parameters determined, calibration curve used, associated method blanks, and any dilutions.

The data set for the RA sampling will be available for access by the site manager and project staff.

11.0 Performance and System Audits

Performance and system audits of both field and laboratory activities may be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the FSP and QAPjP. The field and laboratory audits include two separate independent parts: internal and external audits.

11.1 Field Audits

An internal audit of field activities may be conducted by CH2M HILL's SM. The audit would include an examination of field sampling records, field instrument operating records, sample collection, handling, and packaging in compliance with the established procedures, maintenance of QA procedures, chain-of-custody, etc.

An additional external audit of the field procedures may be conducted by the USEPA Region 5.

11.2 Laboratory Audits

The laboratory(ies) may be audited by reviewing its QAP and/or SOPs that will be reviewed include, but will not be limited to: documentation on sample receiving and sample log-in, sample storage procedures, chain-of-custody procedures, sample preparation and analysis, instrument operating records, data reduction, and data reporting procedures.

At the discretion of CH2M HILL with the approval of USEPA, onsite audits of the laboratory(ies) may be conducted by the Project Chemist.

External audits of the laboratory(ies) may also be conducted by the USEPA Region 5.

12.0 Preventive Maintenance Procedures

12.1 Laboratory Instruments

As part of their QA/QC program, a routine preventive maintenance program will be required by the selected analytical laboratory(ies). The objective of the preventive maintenance program is to minimize instrument failure and other system malfunctions. The laboratory(ies) will have an internal group to perform routine schedule maintenance and to repair or to coordinate with the vendor for the repair of all instruments. All laboratory instruments will be maintained in accordance with manufacturer's specifications and within the requirements of the specific method.

13.0 Specific Routine Procedures to Assess Data Precision, Accuracy, and Completeness

13.1 Field Measurements

The Project Chemist will assess the field data and review the field results for compliance with the established QC criteria that are specified in the QAPjP and FSP. Accuracy of the field measurements will be assessed using daily instrument calibration and blanks analysis. Precision will be assessed on the basis of reproducibility by analyzing duplicate samples. Data completeness will be calculated using Equation 13-1.

$$\% \text{ Completeness} = \frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100 \quad \text{Equation 13-1}$$

13.2 Laboratory Data

Laboratory results will be assessed for compliance with required precision, accuracy, completeness, and sensitivity as follows:

13.2.1 Precision

For organic analyses, laboratory analysis precision will be assessed by reviewing field duplicate sample results. The relative percent difference (%RPD) will be calculated for the duplicate samples using Equation 13-2.

$$\% \text{ RPD} = \frac{S - D}{(S + D) / 2} \times 100 \quad \text{Equation 13-2}$$

Where: S = First sample value (original value)
 D = Second sample value (duplicate value)

13.2.2 Accuracy

Laboratory results accuracy will be assessed for compliance with the established QC criteria described in Section 4 of the QAPjP using the analytical results of laboratory control samples and method, and field blanks. The percent recovery (%R) of laboratory control samples will be calculated using Equation 13-3.

$$\% \text{ R} = \frac{A}{B} \times 100 \quad \text{Equation 13-3}$$

Where: A = The analyte concentration determined experimentally from the
laboratory control sample

B = The known amount of the concentration in the sample

13.2.3 Completeness

The data completeness of laboratory analyses results will be assessed for compliance with the amount of data required for decisionmaking. The completeness is calculated using Equation 13-1.

14.0 Corrective Actions

Corrective actions may be required for two classes of problems: analytical and/or equipment problems and noncompliance problems. Analytical and equipment problems may occur during sampling, sample handling, sample preparation, laboratory instrumental analysis, and data review. If the problem is analytical in nature, information on these problems will be promptly communicated to CH2M HILL's SM and the Project Chemist. Implementation of corrective action will be confirmed in writing through the same channels.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the SM, who in turn shall notify the RPM. Any nonconformance with the established quality control procedures in the QAPjP will be identified and corrected in accordance with the QAPjP. The USEPA, RPM or their designee will issue a nonconformance report for each nonconformance condition.

14.1 Sample Collection/Field Measurements

Technical staff and project personnel will be responsible for reporting all suspected technical or QA nonconformances or suspected deficiencies of any activity or issued document by reporting the situation to the SM. The SM will be responsible for assessing the suspected problems in consultation with the Project Chemist and for making a decision based on the potential for the situation to affect the quality of the data. If it is determined that the situation warrants a reportable nonconformance requiring corrective action, then a nonconformance report will be initiated by the SM.

Field corrective actions will be implemented and documented in the field log book. No staff member will initiate a corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be stopped by a stop-work order by the RPM.

The SM will be responsible for ensuring that corrective action for nonconformances is initiated by:

- Evaluating all reported nonconformances
- Controlling additional work on nonconforming items
- Determining disposition or action to be taken
- Maintaining a nonconformance log
- Reviewing nonconformance reports and corrective actions taken
- Ensuring nonconformance reports are included in the project files

Corrective action for field measurements may include:

- Repeating the measurement to check the error
- Checking for all proper adjustments for ambient conditions such as temperature
- Checking the batteries
- Recalibrating
- Checking the calibration
- Replacing the instrument or measurement devices
- Stopping work (if necessary)

The SM is responsible for site activities. In this role, the SM may be required to adjust the site programs to accommodate site-specific needs. When it becomes necessary to modify a program, the SM notifies the RPM of the anticipated change and implements the necessary changes after obtaining the approval of the RPM. The SM is responsible for controlling, tracking, and implementing the identified changes. Reports on all changes will be distributed to all affected parties, including the USEPA RPM.

14.2 Laboratory Analyses

Corrective actions are required whenever an out-of-control event or potential out-of-control event is noted. The investigative action taken is somewhat dependent on the analysis and the event.

Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the warning or acceptable windows for precision and accuracy
- Blanks contain target analytes above acceptable levels
- Undesirable trends are detected in the RPD between collocated samples
- There are unusual changes in detection limits
- Deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation samples
- Inquiries concerning data quality are received

Corrective action procedures are often handled at the bench level by the analyst who reviews the preparation or extraction procedure for possible errors and checks the instrument calibration, calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA department for further investigation. Once resolved, full documentation of the corrective action procedure is filed with the QA department, and included in the case narrative portion of the analytical report.

15.0 Quality Assurance Reports to Management

In addition to the audit reports that may be submitted to the SM in accordance with QAPjP Section 11, a monthly progress report that addresses all QA issues and corrective actions proposed or already taken is submitted to the EPA RPM. Items summarized in the monthly report include the progress made during the reporting period, problems resolved and recommended solutions, deliverables submitted, activities planned for the next reporting period and key personnel changes made. The RA Summary Report will contain QA sections that summarizes data quality information collected during the project.

Appendix A
Field Sampling Plan

APPENDIX A

Field Sampling Plan for Soil Cleanup Verification and Post-Remediation Compliance Monitoring at the ECC Site

1. Introduction

This Field Sampling Plan (FSP) presents the sampling and analysis approach for the co-located sampling which will be conducted by the USEPA during the ECC Remedial Action. The USEPA will conduct soil cleanup verification sampling to verify remedial action goals have been met by Soil Vapor Extraction (SVE) in the northern two-thirds of the site and the excavated "Southern Concrete Pad" area. After soil cleanup verification has been achieved, the USEPA will participate in compliance monitoring which will be conducted for a period of 7-3 years. The Consent Decree requires a total of 7 years of compliance monitoring by the ECC Trust. However, for the purposes of the current USEPA RAC Statement of Work, 3 years of activities are planned for this FSP. The USEPA will also participate in the establishment of background groundwater and surface water concentrations by collecting co-located upgradient groundwater and upstream surface water and flow measurements over a 12-month period prior to the SVE system operation.

The sampling and analysis activities to be conducted by the USEPA include the following:

Establishing Background Concentrations

- Analysis of surface water samples (1 of 2 locations) for selected VOCs, BNAs, PCBs, and inorganics as collected during one of six storm events over a 12-month period.
- Analysis of groundwater samples (2 locations) for selected VOCs, BNAs, PCBs, and inorganics collected during one of the monthly sampling events bimonthly over a 12-month period.

Soil Cleanup Verification

- Analysis of groundwater (1 of 4 onsite locations) for selected VOCs, BNAs, PCBs, and inorganics annually for an estimated 3 years of SVE operation; and
- Analysis of groundwater (1 of 11 offsite locations) for selected VOCs, BNAs, PCBs, and inorganic quarterly for years 1 and 3 and semi-annually for year 2 of SVE operation; and

- Analysis of soil samples (approximately ~~6920~~ samples) for selected VOCs, phenol, and 1,2-dichlorobenzene.

Compliance Monitoring

- Analysis of groundwater (~~11 offsite locations, 1 of 4 onsite locations~~) and surface water (1 of 3 locations) for selected VOCs, BNAs, PCBs, and inorganics semiannually for an estimated 3 years of compliance monitoring; and 7 years.
- Analysis of groundwater (1 of 11 offsite locations) for selected VOCs, BNAs, PCBs, and inorganics semiannually for 3 years.

2. Field Sampling Plan Objectives

The selected remedy for the site includes excavation of contaminated soils from the southern end of the site, placement of these soils on the northern end of the site, remediation of the consolidated contaminated soils using in-situ SVE, and capping. Prior to, during, and after SVE operation, the ECC Trust will be collecting soil vapor, soil, groundwater, and surface water data to determine the completeness and effectiveness of the remediation activities. The USEPA intends to collect co-located samples with the ECC Trust (1) prior to SVE operation to establish background groundwater and surface water concentrations, and (2) after SVE operation (both short-term and long-term) to verify remedial action objectives have been met. The objective of this FSP is to determine sample location and sample size rationale for the soil verification sampling, and define sampling procedures for soil, groundwater, and surface water sampling.

3. Sampling Design and Rationale

This sampling plan includes sample locations, frequency of sampling, and analyses for the following phases of the remedial action: background sampling, soil cleanup verification, and post-compliance monitoring. The sampling locations and frequency of sampling for the background and compliance monitoring activities (i.e., groundwater and surface water sampling) were established in Exhibit A of the Consent Decree and are described in the following subsections. The USEPA intends to collect co-located samples at approximately 10 percent of the groundwater and surface water locations while maintaining 100 percent split sample analysis of the confirmational soil sampling. The soil cleanup verification soil sampling locations have been determined based on statistical analysis of contaminant distribution. Attachment A-1 presents the rationale for the soil sample locations and sample size. Table A3-1 presents sample parameters, locations, and frequency for all sampling media. The required cleanup concentrations of the identified contaminants were presented in Tables 2-4 through 2-6 in the QAPjP.

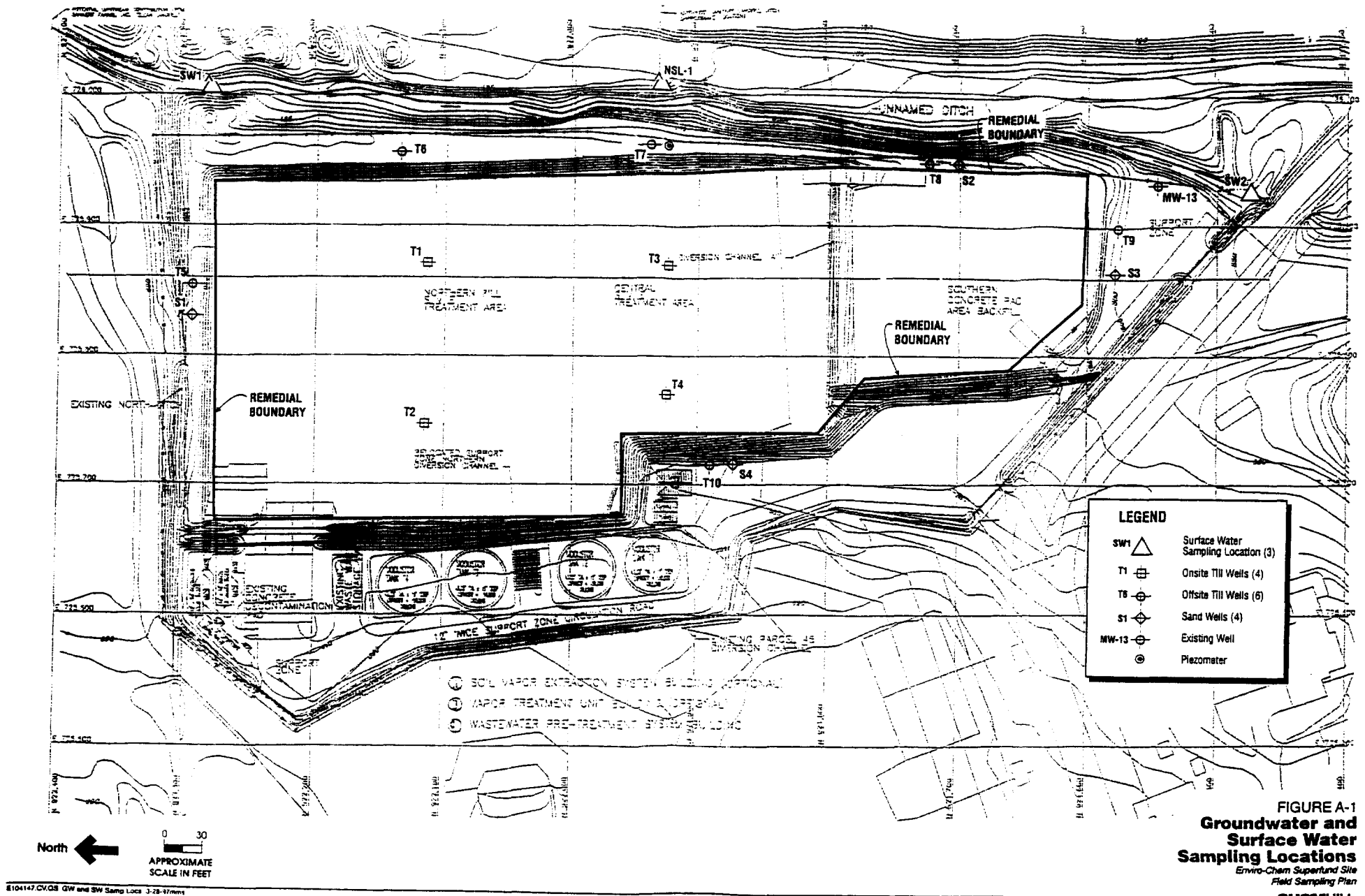


TABLE A3-1

Sampling and Analysis Summary for USEPA RA Activities

Sample Matrix	Laboratory Parameters	Samples ⁽²⁾		
		Number of Locations	Freq.	Total ^(1,4)
Background Groundwater and Surface Water Sampling				
Till Well T5 and Sand/Gravel Well S1 (offsite)	VOCs	2	Monthly <u>Once⁽⁵⁾</u>	224
	BNAs	2		224
	PCBs	2		224
	Chromium VI	2		224
	Tin	2		224
	Antimony	2		224
	Other Metals ⁽³⁾	2		224
	Cyanide	2		224
Surface Water Location SW-1 (Unnamed Ditch) and NSL-1 (Northside Sanitary Landfill Ditch)	VOCs	12	6 Events/Year <u>Once⁽⁶⁾</u>	112
	BNAs	12		112
	PCBs	12		112
	Arsenic	12		112
	Chromium VI	12		112
	Lead	12		112
	Nickel	12		112
	Zinc	12		112
	Cyanide	12		112
Soil Cleanup Verification Phase				
Onsite Groundwater ⁽²⁾ (4 Till Monitoring Wells—T1, T2, T3, T4)	VOCs	14	Prior to SVE startup Semi-annual (Years 1&2) Quarterly (Years 3+) while SVE in operation <u>Annual⁽⁷⁾</u>	FBD3
	BNAs	14		3
	PCBs	14		3
	Chromium VI (Cr ⁺⁶)	14		3
	Tin	14		3
	Antimony	14		3
	Other Metals ⁽³⁾	14		3
	Cyanide	14		3
Soils	VOCs	69	Once⁽⁸⁾ +	69
	Phenol	69		69
	1,2-Dichlorobenzene	69		69
		44 (min.)		44 (min.)
		44 (min.)		44 (min.)
		44 (min.)		44 (min.)
Offsite Groundwater ⁽²⁾ (6 Till—T5, T6, T7, T8, T9, T10 and 4 Sand/Gravel—S1, S2, S3, S4) and ECC-MW-13	VOCs	1	Quarterly (Year 1) Semi-annually (Year 2) Quarterly (Years 3+) while SVE in	10
	BNAs	1		10
	PCBs	1		10
	Arsenic	1		10
	Chromium VI (Cr ⁺⁶)	1		10
	Lead	1		10
	Nickel	1		10
	Zinc	1		10

TABLE A3-1

Sampling and Analysis Summary for USEPA RA Activities

Sample Matrix	Laboratory Parameters	Samples ⁽²⁾		
		Number of Locations	Freq.	Total ^(1,4)
	Cyanide	1	operation ⁽⁹⁾	10 TBD
		++		
		++		
		++		
		++		
		++		
		++		
		++		
		++		
		++		
Compliance Monitoring Phase				
Offsite Wells (6 Till—T5, T6, T7, T8, T9, T10 and 4 Sand/Gravel—S1, S2, S3, S4) and ECC-MW-13 ⁽²⁾	VOCs	1	Semi-annually ⁽⁹⁾ (7) years	6
	BNAs	1		6
	PCBs	1		6
	Arsenic	1		6
	Chromium VI (Cr ⁶)	1		6
	Lead	1		6
	Nickel	1		6
	Zinc	1		6
	Cyanide	1		154
		++		154
		++		154
		++		154
		++		154
		++		154
Onsite Wells (4 Till—T1, T2, T3, T4) ⁽²⁾	VOCs	1	Semi-annual (7) years Annual <u>y⁽¹⁰⁾</u>	3
	BNAs	1		3
	PCBs	1		3
	Chromium VI (Cr ⁶)	1		3
	Tin	1		3
	Antimony	1		3
	Other Metals ⁽³⁾	1		3
	Cyanide	1		3
		4		56
		4		56
		4		56
		4		56
		4		56
		4		56
	4	56		

TABLE A3-1

Sampling and Analysis Summary for USEPA RA Activities

Sample Matrix	Laboratory Parameters	Samples ⁽²⁾		
		Number of Locations	Freq.	Total ^(1,4)
Surface Water (up and downstream—unnamed ditch—SW-1 and NSL ditch—NSL-1)	VOCs	1	Semi-annual	3
	BNAs	1	(7) years Annual	3
	PCBs	1	<u>y⁽¹¹⁾</u>	3
	Arsenic	1		3
	Chromium VI (Cr ⁶)	1		3
	Lead	1		3
	Nickel	1		3
	Zinc	1		3
	Cyanide	1		42
		3		42
		3		42
		3		42
		3		42
		3		42
		3		42
		3		42
		3		42

Key

VOCs = Volatile Organic Compounds

BNAs = Base Neutral/Acids

PCBs = Polychlorinated Biphenyls

TBD = To Be Determined

Notes

(1) The number of samples shown assumes 3 2-years of SVE operation and 3 7-years of post remediation onsite and offsite monitoring, and do not represent potential requirements of resampling (e.g., additional soil samples if soils criterion is not met during the cleanup verification phase, and SVE must be restarted). Groundwater sampling may continue during the cleanup verification phase beyond 3 2-years if the SVE system is operating during such periods.

(2) Both filtered and unfiltered groundwater sample volumes will be required.

(3) Other Metals- arsenic, barium, beryllium, cadmium, lead, manganese, nickel, silver, vanadium, and zinc.

(4) The total number of samples does not include QC samples. QC samples include trip blanks, field blanks, field duplicate, and matrix spike/matrix spike duplicate (MS/MSD) samples. The frequency of QC samples is discussed in Section 4.

(5) The PRP's subcontractor will collect samples monthly for 12 months. CH2M Hill will collect co-located samples during one of the monthly sampling events.

(6) The PRP's subcontractor will collect samples during 6 events over a period of 12 months. CH2M HILL will collect co-located samples at one sample location during one of the monthly sampling events.

(7) The PRP's subcontractor will collect samples at all 4 locations prior to SVE startup, semi-annually during years 1 and 2, and quarterly thereafter (years 3+) while the SVE is in operation. CH2M HILL will collect co-located sample annually at one location.

(8) Fifty-four soil samples are estimated to be collected from the northern SVE area. Fifteen soil samples are estimated to be collected from the southern concrete pad excavation area.

(9) The PRP's subcontractor will collect samples at all 11 locations. CH2M HILL will collect co-located samples at one of the locations per sampling event.

- (10) The PRP's subcontractor will collect samples at all 4 locations semi-annually. CH2M HILL will collect co-located samples at one location on an annual basis.
- (11) The PRP's subcontractor will collect samples at all 3 locations semi-annually. CH2M HILL will collect co-located samples at one location on an annual basis.

3.1 Background (Upgradient) Groundwater and Surface Water Sampling Rationale

The criteria for determining background groundwater and surface water concentrations is described in Footnotes (2) and (4) of Table 3-1 in Exhibit A of the Consent Decree.

Background samples from two offsite upgradient wells (till well T5 and sand/gravel well S1), the upstream surface water location (SW-1) in the unnamed ditch, and the Northside Sanitary Landfill (NSL) ditch discharge (NSL-1) will be collected. Sample locations are shown on Figure A-1. Background concentrations will be applied as described below.

For groundwater, in the event that higher concentrations than those set forth for any parameter in Table 2-5 of the QAPjP are present in the upgradient subsurface water in the till and/or sand and gravel according to the procedure specified below, then those higher upgradient subsurface water concentrations and not the values set forth in the table shall constitute the Acceptable Subsurface Water Concentrations within the meaning of Exhibit A of the Consent Decree. The upgradient subsurface water concentrations are referred to in Exhibit A as "Applicable Subsurface Water Background Concentrations." Twelve groundwater samples will be taken from T5 and S1 over at least a 12-month period.

Applicable Subsurface Water Background Concentrations will be determined using standard statistical procedures as follows:

- The mean and standard deviations will be determined from the twelve sample results (till and sand/gravel) for each parameter. Non-detected results will be assigned a value of one half the EPA approved quantitation limit;
- The Applicable Subsurface Water Background Concentration will be set at two standard deviations above the calculated means per parameter; and
- In the event that the Applicable Subsurface Water Background Concentrations are higher than the Table 2-5 of the QAPjP acceptable concentrations, the "Applicable Concentrations" will become the Acceptable Subsurface water Concentration, as appropriate, and replace the values presently contained in Table 2-5 of the QAPjP.

For surface water, 12 grab samples will be collected annually from SW-1 and NSL-1 during wet weather. These samples will be collected during at least six storm events over a 12-month period.

Flow rates will be measured at all sampling locations during each sampling event by the ECC Trust's consultant. In the event that direct flow rate measurement is not practical, flow rates will be estimated by using one of the methods described in Section 3 of the NPDES Storm Water Sampling Guidance Document¹, or by using a salt-dilution tracer such as lithium chloride injected at a known rate upgradient of individual sampling locations.

¹ United States Environmental Protection Agency. 1992. *NPDES Storm Water Sampling Guidance Document*. Office of Water: Washington, D.C. Publication number EPA 833-B-92-001.

Rainfall intensity will be obtained by the ECC Trust's consultant from an onsite rain gauge², and a relationship will be established between rainfall intensity and flow at NSL-1 for use in the compliance monitoring.

An attempt will be made to limit sampling events to representative storm events as established in the *NPDES Storm Water Sampling Guidance Document*. The criteria for determining a representative storm event indicate that (1) the storm must result in greater than 0.1-inch accumulation; (2) the storm must be preceded by at least 72 hours of dry weather; and (3) where feasible, the depth of rain and duration of the event should not vary by more than 50 percent from the average depth and duration.

For each parameter, the analytical results from the 12 samples will be analyzed using standard statistical procedures. The mean and standard deviation will be calculated, and all nondetects will be assigned a value equal to one-half the EPA-approved quantification limit. Applicable surface water background concentrations will be calculated as two standard deviations above the calculated mean of these 12 samples. Equation 2 in Attachment A-2 estimates the mass contribution from background.

In the event that higher concentrations than those set forth for any parameter in Table 2-5 of the QAPjP are present in the background surface water, then those higher background concentrations and not the values set forth in the table shall constitute the Acceptable Stream Concentrations within the meaning of Exhibit A of the Consent Decree. Those higher background surface water concentrations are referred to in Exhibit A as "Applicable Surface Water Background Concentrations." Six surface water samples will be taken from the Unnamed Ditch upstream of the site, and from NSL-1, over at least a 12-month period.

The minimum 12-month background sample period is defined as a minimum 12-month period ending on or before start of the SVE System operation. This period may include the startup testing of the SVE System prior to full-scale operation.

3.2 Soil Cleanup Verification

Soil cleanup verification monitoring will be performed to determine site cleanup and will commence after the start of the SVE system full-scale operation.

Verification of soil cleanup will be established when each of the following criteria are met:

- Soil vapor concentration results collected by the ECC Trust's consultant comply with calculated soil vapor concentrations in equilibrium with Acceptable Soil Concentrations for the site;³
- Concentrations of target constituents within groundwater from onsite (within the remedial boundary) till wells comply with Acceptable Subsurface Water Concentrations or Applicable Subsurface Water Background Concentrations; and

² A rain gauge will be periodically monitored to obtain data on the rainfall intensity as a function of time; however, rainfall intensity will not be continuously recorded.

³ See Table 1-2 of the Trustee's Quality Assurance Project Plan (QAPP), Revision 1, March 7, 1997.

- Concentrations of target constituents within onsite soils comply with Acceptable Soil Concentrations.

3.2.1 Onsite Groundwater

Four new onsite till monitoring wells will be installed by the ECC Trust as the onsite subsurface water monitoring system to be used for the establishment of verification of meeting the Applicable Subsurface Water Concentrations established in Exhibit A. Figure A-1 shows the locations of these proposed monitoring wells.

The four new onsite till monitoring wells will be sampled prior to start-up and semi-annually thereafter until completion of the SVE program which is projected to be for planning purposes at the end of the third ~~second~~ year after start-up of the SVE system. After Soil Cleanup Verification has been established, sampling of the onsite till monitoring wells will be conducted for 7-3 years on a semiannual basis. The onsite till water samples will be analyzed for the parameters with Acceptable Subsurface Water Concentrations listed in Table 2-5 of the QAPjP. To meet the Onsite Till Water Criteria, the sample concentrations collected from the onsite till wells must be at or below the Acceptable Subsurface Water Concentrations or the Applicable Subsurface Water Background Concentrations, whichever are highest, as defined in Footnote 2 of Table 3-1 of Exhibit A.

Determination of applicable background concentrations and background sampling locations was discussed in Section 3.1. The most recent semiannual sampling results from the four onsite till water wells collected after the Soil Vapor Criteria have been achieved will be used to demonstrate verification of meeting the Onsite Till Water Criteria.

3.2.2 Onsite Soil

Once the Soil Vapor Criterion and Onsite Till Water Criterion for Soil Clean-up Verification have been demonstrated as defined above, soil samples from areas selected by USEPA and the state will be collected. Each soil sample will be analyzed for the parameters listed in Table 2-4 of the QAPjP. If the results from this initial round of soil samples verify that the Acceptable Soil Concentrations in Table 2-4 of the QAPjP have been met, then the Soil Sample Criterion for Soil Clean-up Verification will have been achieved.

In the event that the soil sampling results do not verify that the Acceptable Soil Concentrations as defined in Table 2-4 of the QAPjP have been met, and the SVE system is operated for an additional period of time, additional soil samples will be taken in the same approximate locations as the initial sample locations where acceptable soil concentrations had not been shown. Results from this second sampling will be analyzed using the identical procedure outlined above to verify that the Acceptable Soil Concentrations in Table 2-4 of the QAPjP have been met. If the results from any subsequent round of soil samples demonstrate that the Acceptable Soil Concentrations in Table 2-4 of the QAPjP have been met, then the Soil Sample Criterion for Soil Clean-up Verification will have been achieved.

If Soil Cleanup Verification as defined in Section 4.2 of the revised Exhibit A (May 7, 1997) is not achieved within 5 years of commencing operation of the SVE system, the Additional Work Provisions of Section VII of the Consent Decree will apply.

Attachment A-1 presents the statistical approach used to determine the number of soil samples to be collected. A total of ~~5429~~ soil samples are proposed for the SVE area and 15 soil samples are proposed for the Southern Concrete Pad area.

3.3 Post-Soil Cleanup Compliance Monitoring

Compliance monitoring will be conducted for a period of ~~three (3)~~^{seven (7)} years after Soil Cleanup Verification has been achieved, using new offsite (outside of remedial boundary) wells installed in till and sand and gravel groundwater zones associated with the site. In addition, the onsite (within remedial boundary) till wells used for achievement of the Onsite Till Water Criteria, an existing monitoring well, and three offsite surface water points located east of the remedial boundary zone will also be included in the Post Soil Cleanup Compliance Monitoring.

3.3.1 Groundwater

The offsite groundwater compliance monitoring system will consist of six new till monitoring wells, four new sand and gravel monitoring wells, and one existing sand and gravel monitoring well (ECC-MW13). Figure A-1 shows the locations of the proposed monitoring well systems.

Two of the new compliance monitoring system wells (one well in the till and one well in the sand and gravel unit) will be installed for purposes of background concentrations monitoring. The background well cluster is proposed to be directly north of the northern remedial boundary based on the natural groundwater flow direction. The new background location is necessary because the original background wells, ECC-MW1, MW-1A, have been destroyed and are therefore not available for sampling.

Samples from the six offsite till monitoring wells, the four offsite sand and gravel monitoring wells, and the existing monitoring well (ECC-MW13) will also be collected prior to start-up of the SVE system and semiannually during the operation of the SVE system. After the Soil Cleanup Verification has been established, samples will be collected semiannually from the offsite monitoring wells for ~~3~~⁷ years. The offsite groundwater samples will be analyzed for the parameters with Acceptable Stream Concentrations listed in Table 3-1 of Exhibit A as shown in Table 2-6 of the QAPjP. The number of compliance monitoring groundwater samples to be collected is summarized in Table A3-1.

Both unfiltered and filtered subsurface water samples will be collected. Only unfiltered samples will initially be analyzed for VOCs, SVOCs, inorganics, and PCBs. If the results of any unfiltered sample exceeds a cleanup standard for inorganics or PCBs, then the filtered sample will be released for analysis of inorganics and PCBs only.

Prior to groundwater sampling, each well will be purged as described in Section 5.2.3. Static water levels will also be measured at each sampling event. In addition, the water level will be measured in the piezometer to be located on the eastern boundary of the Site as indicated on Figure A-1. Detailed procedures for water level measurement are described in Section 5.2.1.

3.3.2 Surface Water

Determination if the ECC Site is contributing contamination to Unnamed Ditch will be calculated based on discharge flow rates and pollutant concentrations. Surface water compliance monitoring will be conducted at the same frequency as the offsite groundwater compliance samples. The number of compliance monitoring surface water samples to be collected is summarized in Table A3-1. Grab samples and flow measurements will be collected from SW-1 and SW-2. If sampling occurs during a rain event, flow for the NSL Channel will be estimated using rainfall intensity and the relationship established during background sampling. Mass balance equations for compliance determination are included as Attachment A-2. Equation 1 will be used to determine the contribution of contaminants, if any, from the ECC site. In the event that the applicable background concentration for any parameter is higher than the stream concentration presented in Table 2-6 of the QAPjP, then those higher background concentrations will constitute the Acceptable Stream Concentrations for the purpose of compliance determination.

4. Sample Designation

A sample numbering system has been developed for the ECC project by the ECC Trust's consultant that includes the following sequential information:

- Name of Site—Enviro-Chem (EC);
- Sample Matrix—Subsurface water (TGW or SGW, to indicate a till or sand and gravel well), surface water (SW), soil (S), trip blank (TB);
- Soil, monitoring well, or surface water sampling location, or trip blank number;
- Sample Depth (for soil samples only)—Upper depth or single depth (1) and lower depth (2);
- Sample Round; and
- Quality Assurance/Quality Control (QA/QC) Modifiers—Field blank (B), field duplicate (D), and matrix spike/matrix spike duplicate (M).

To designate samples collected by the USEPA as co-located samples, the prefix "CH" will be added to the beginning of the sample name. For example, a sample from the till monitoring well number 1 co-located during the first round of groundwater sampling, would be labeled CHECTGW1-01, and a field duplicate of that same sample would be designated CHECTGW1-01-D. An example of a soil sample designation is CHECS7-01-1, which would be a Round 1 sample from location 7, collected in the upper sampling depth.

All field samples will be identified with sample identification labels that include the sample designation and the following additional information:

- Site Name;
- Project Number;
- Name of collector;

- Affiliation of collector;
- Day and time of collection;
- Analysis requested; and
- Analysis code.

Additional details regarding sample documentation is presented in Appendix C.

5. Sampling Procedures and Equipment

Detailed procedures for sample collection and a general description of the proposed sampling equipment are presented in this section. Detailed information pertaining to equipment maintenance and calibration was presented in Section 7 of the QAPjP. As samples are to be collected as co-located samples with the ECC Trust's consultant, the samples will physically be collected by their consultant, with their equipment. The procedures and equipment described in this QAPjP/FSP are consistent with the ECC Trust's QAPjP and FSP. All sampling activities will be documented in the field logbook, as described in Section 6 of the QAPjP.

5.1 Soil

5.1.1 Surface Soil

Surface soils may be collected using a wide variety of equipment. Spoons, shovels, hand augers, push tubes, and posthole diggers made of the appropriate material may be used to collect surface soil samples. Surface soils may also be collected using an excavator for deep excavations as long as care is taken to not collect any soils which come in contact with the excavators bucket.

Surface samples are removed from the ground and placed in pans (or bowls), where they may be mixed thoroughly (except for VOCs) before sample containers are filled. It is extremely important that soil samples for non-VOC analysis be mixed as thoroughly as possible to ensure that the sample is homogeneous and representative. After collection, all sample handling should be minimized. Personnel should use extreme care to ensure that samples are not contaminated. If samples are placed in an ice chest, personnel should ensure that melted ice cannot cause sample containers to become submerged, as this may result in sample cross-contamination. Plastic bags, such as Zip Lock ® bags, should be used when small sample containers are placed in ice chests to prevent cross-contamination.

5.1.2 Subsurface Soil

Subsurface Soil samples will be collected by using a 2-inch diameter split-spoon sampler at the locations and depths specified in Attachment A-1.

The procedure to obtain soil samples is as follows:

- A 2-foot by 2-foot hole will be dug by hand into the temporary cover (3 feet of clay and 6 inches of top soil), keeping each cover layer separate;

- Soil samples will be collected at the specified depths using a drill rig, taking into account the depth of the fill used to grade the site prior to installing the temporary cover;
- Soil samples will be homogenized before collection. Consultants of the Trust and the USEPA will alternate filling samples jars with soil (i.e., a single person using a single hand trowel will fill all jars, alternating between the Trust's and the USEPA's jars. Soil samples to be analyzed for VOCs will not be homogenized before collection; and
- The temporary cover layers will be replaced.

One duplicate sample will be collected per group of 10 or fewer soil samples. Drilling augers will be steam cleaned between each sampling location, and split-spoon samplers will be steam cleaned and rinsed with distilled water between the collection of each sample. Any other equipment that comes into contact with a sample will be decontaminated as described in Table A5-1.

TABLE A5-1
 Decontamination Protocol for Sampling Equipment

Step Number	Description
1	Scrub equipment thoroughly with soft-bristled brushed in a low-suds detergent solution.
2	Rinse equipment with tap water by submerging and/or spraying; retain drippings.
3	Rinse equipment with methanol by spraying until dripping; retain drippings.
4	Rinse equipment with distilled water by spraying until dripping; retain drippings.
5	Rinse equipment with distilled water a second time by spraying until dripping; retain drippings.
6	Place equipment on plastic or aluminum foil and allow to air dry for 5 to 10 minutes.
7	Wrap equipment in aluminum foil for handling and/or storage until next use.

5.1.3 Soil VOC Samples

Soil samples to be collected for analysis of VOCs should be collected following one of the EPA Methods 5035 procedures for collecting VOCs contained in Appendix D.

5.2 Groundwater

The following procedures for water level measurement, well depth measurement, well purging, and groundwater sample collection will be followed during monitoring well sampling.

5.2.1 Water Level Measurement

Static water levels will be measured to the nearest 0.01 foot in each monitoring well and the piezometer at each sampling event and recorded in the field notebook. The water level

surface will be measured prior to well purging and sampling by using an electronic water level meter. Before lowering the probe in the well, the batteries will be checked by pressing the test button on the instrument. The probe will be slowly lowered into the well until contact with the water surface is indicated on the meter. The probe will be withdrawn just above the water surface, and a reading will be taken prior to withdrawing the probe from the well. The reading will be recorded in the field logbook. The probe will be decontaminated prior to inserting the instrument into a well by washing with a detergent such as Alconox, rinsing with methanol, and rinsing three times with distilled water.

Each well will have a reference point, indicated on the inner well casing, from which water level measurements will be taken. The reference point elevation on the well will be established by a survey with respect to U.S. Datum mean sea level elevation to an accuracy of 0.01 feet for computation of the subsurface water elevation.

5.2.2 Well Depth Measurement

The total depth of the well will be measured and recorded prior to well purging and sampling by the ECC Trust's contractor with USEPA oversight. A weight tied to a length of cotton cord will be used to tag the bottom of the well, and the length of cord used will be measured to establish well depth. The weight will be rinsed with distilled water and the cotton cord will be replaced between measurements.

5.2.3 Well Evacuation

Standing water in the wells will be removed prior to sampling by purging until: (1) at least three well volumes have been removed; (2) the well yields low turbidity water; and (3) consistent values of temperature, pH, and specific conductance are achieved. If the well goes dry before three well volumes have been removed, samples will be taken as soon as the well recovers. The calculation of well volume will be as follows:

- The well casing inside diameter will be measured;
- The static water level below the measuring point will be determined;
- The total depth of the well will be identified from the measuring point;
- The number of linear feet of static water will be calculated as the total depth of the well minus the static water level; and
- The static volume (well volume) will be calculated in gallons as:

$$V = (\pi r^2)(h)(7.48)$$

Where:

V = well volume (gal)

π = 3.14

r = well radius (ft)

h = linear feet of static water (ft)

Dedicated Teflon or stainless steel bailers will be used for purging and sampling the wells. Purged water will be placed in containers for subsequent handling and disposal in

accordance with Federal, state, and local regulations based upon the results of chemical analysis. Bailers, pumps, and all other equipment shall be decontaminated prior to insertion into the well. Decontamination will consist of steam cleaning or washing with a detergent such as Alconox, rinsing with methanol, and rinsing three times with distilled water. Bailer ropes and sampling gloves will be discarded after sampling each well.

5.2.4 Groundwater Sampling

During sampling, special care will be taken to avoid physically altering or chemically contaminating the samples. Sampling of onsite till wells will not occur until the SVE system has been shut down, and till waters have been given sufficient time to stabilize as described in Section 5.2.3.

Sampling will be performed with bottom-filling Teflon or stainless steel bailers. Subsurface water pH, specific conductance, and temperature will be determined in the field on secured samples. Sample volumes will be collected in the following order:

- Volatile organics;
- Base neutral/acid extractable organics;
- Polychlorinated biphenyls (PCBs);
- Metals; and
- Cyanide.

Co-located samples will be collected by alternating the ECC Trust's sample bottle and the USEPA's sample bottle when filling. Samples of subsurface water will be prepared, preserved, and stored as described in Section 6.0. All sampling equipment will be decontaminated between samples following the procedures in Table A5-1.

The objective of the subsurface water sampling for the metals and PCBs shown in Table 2-8 of the QAPjP is to determine the concentration of dissolved constituents. Therefore, subsurface water samples for metals and PCB analyses will be filtered through a nonmetallic 0.45-micron pore size membrane immediately after collection. The first 150 to 200 mL of filtrate will be used to rinse the filtration apparatus of any contaminants. This technique minimizes the risk of altering the composition of the samples by the filtering operation. The filtrate for metals analysis will be collected in a polyethylene bottle and immediately acidified to a pH < 2 using nitric acid. The filtrate for chromium VI analysis will not be acidified. The filtrate for PCB analysis will be collected in amber glass bottles.

One field blank sample will be collected for each group of 10 or fewer samples. Equipment rinsate blank samples will be prepared immediately after collection of a field sample by pouring distilled water through a decontaminated bailer into the appropriate sample container. Preparation of the field blank will occur onsite.

One field duplicate sample will be obtained for each group of 10 or fewer compliance samples.

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of one per group of 20 or fewer compliance samples designated for organics analysis.

Trip blank samples will be provided by the laboratory selected to perform volatile organic analysis at a frequency of one per shipping container of samples.

5.3 Surface Water

The surface water will be monitored by sampling the unnamed ditch just upstream and just downstream of the ECC Site, and at NSL-1 (Figure A-1). To collect a surface water sample, the sample container will be submerged in the water, removed, and immediately capped. The container mouth will be positioned so that it faces upstream, while the sampling personnel are standing downstream to prevent the stirring up of any sediments that would contaminate the sample. Sampling will progress from the most downstream location to the upstream locations. The sample will be transferred to laboratory supplied containers that contain the appropriate preservatives in the following order:

- Volatile organic compounds
- Base neutral/acid extractables
- Polychlorinated biphenyls
- Inorganic parameters

Co-located samples will be collected by alternating the collection of an ECC Trust's sample bottle with a USEPA sample bottle. The filled sample containers will be bagged and placed in an insulated cooler with ice and transferred to the laboratory under chain-of-custody procedures.

Quality control samples (field blanks, field duplicates, and MS/MSD samples) will be collected at the same frequency as specified for subsurface water samples. Decontamination of sampling equipment will consist of washing with a detergent such as Alconox, and rinsing three times with distilled water.

6. Sample Handling and Analysis

The required sample containers, preservation methods, maximum holding times, and filling instructions for each sample type are summarized on Table 2-7 of the QAPjP.

Sample bottles provided by the selected analytical laboratory will be prepared by using the procedures required by the Contract Laboratory Program (CLP). Sample bottles provided by the selected analytical laboratory will be prepared as described in their standard operating procedure (SOP). Reference to sample chain-of-custody procedures are contained in Section 6.

Waste generated onsite will be properly handled and disposed of to prevent contamination of clean areas.

6.1 Sample Packaging and Shipment

Following sampling, the outside of the sample bottles will be rinsed with potable or distilled water near the sampling location. The sample packaging and shipment procedures will be as follows:

- The sample will be properly preserved (if applicable) and liquid levels will be marked if bottles are partially full;
- Custody tags will be securely attached to the sample container, and each container will be placed in a Ziploc bag;
- The sample containers will be placed in a cooler lined with 2 inches of vermiculite or equivalent absorbent material and maintained at 4 degrees C with cold packs or ice sealed in plastic bags as appropriate. The remaining space in the cooler will be filled with additional packing material;
- The chain-of-custody forms and traffic reports will be placed in a Ziploc bag, and the bag will be taped to the inside of the cooler lid;
- The cooler will be closed and sealed shut with strapping tape. If the cooler has a drain port, that port will also be sealed shut with tape. One custody seal will be placed across the front of the cooler, and another seal will be affixed across the hinge area at the back of the cooler. These custody seals will be covered with clear tape;
- An airbill with shipper's and consignee's addresses will be affixed to the top of the cooler. If liquid samples are being shipped, "This End Up" labels will be placed appropriately.
- The samples will be shipped to the appropriate laboratory by using an overnight service; and
- The laboratory will be notified that it will be receiving the samples.

Sample custody procedures are detailed in Section 6. The samples to be analyzed for chromium VI will be sent by priority overnight to the selected analytical laboratory.

6.2 Sample Analysis

Samples will be analyzed following the methods listed in Section 2 of the QAPjP.

Attachment A-1
Soil Cleanup Verification Sampling Rationale

Attachment A-1

Soil Cleanup Verification Sampling Rationale

Introduction

The remedial action for the Environmental Conservation and Chemical Corporation (ECC) site is to excavate contaminated soils from the Southern Concrete Pad area and place the excavated soils over the northern part of the ECC site for remediation of the consolidated contaminated soils using an in-situ soil vapor extraction (SVE) treatment system. The SVE system will extract, concentrate, and destroy the organic contaminants from the soil. The goal of the Soil Cleanup Verification for the ECC site is to collect soil samples to verify that the risk-based cleanup standards for the soils, as specified in Table 3-1 of Exhibit A of the Consent Decree, have been met in both portions of the site.

The estimated area of contamination is an approximation. In order to determine if all soils

Scope

Verification samples will be collected from two distinct areas on the site: from the base and excavated sidewalls of the Southern Concrete Pad area; and from the SVE-treated consolidated soils in the northern and central portion of the site. Figure A-1 of the Field Sampling Plan (FSP) shows the two sample areas. Soil samples will be sent to an offsite laboratory for analysis of selected volatile organic compounds (VOCs), phenol, and 1,2-dichlorobenzene (see Table 3-1 of Exhibit A).

The ECC Trust's contractor will remove soils in the Southern Concrete Pad area down to a depth of 9 feet below ground surface (BGS) plus any remaining contamination identified by visual inspection or field screening. Once an area has been excavated, verification samples will be collected within one working day and the area will then be backfilled. If the results of soil samples collected from the Southern Concrete Pad area are greater than the IDEM RCRA clean closure criteria, the area will be capped. The ECC Trust's contractor may not be able to excavate all of the visually contaminated soils from the Southern Concrete Pad area due to water concerns and practicability. USEPA will take verification samples from the sidewalls and base of excavated areas after the ECC Trust's contractor indicates removal is complete. The excavation area will be backfilled immediately with clean fill once verification sampling is completed by USEPA.

Sampling for both the Southern Concrete Pad area and the SVE treatment area will be done using a systematic grid pattern based on the sample size as described below. Sample collection procedures are described in the Field Sampling Plan (FSP).

Sample Size Rationale

The remedial action cleanup goals were defined in Table 3-1 of Exhibit A. Determination of whether the cleanup goals have been achieved will be made based upon comparison of soil sample results with the acceptable soil concentrations presented in Table 3-1 of Exhibit A and RCRA clean closure criteria. A systematic sampling plan will be used to determine the location of the cleanup verification samples.

A nonparametric method of sample size selection was used to determine the sample sizes for the two areas of the ECC site requiring sampling (see Attachment A-1.1). The method is based upon pre-selection of confidence and coverage [percentile of the population being sampled] and assumes that a single *homogeneous* population is being sampled. Having selected the desired confidence and coverage [and resulting sample size], a uniformly spaced grid of that number of nodes [with a random start point] is positioned within defined areas of relatively homogeneous contamination. The number of samples within an area is independent of the size of the area and is based upon a nonparametric statistical method which calculates the sample size (number of samples) required to estimate a prespecified tolerance interval of the sampled population with a prespecified level of confidence.

The ECC site is divided into two relatively homogeneous areas: the Southern Concrete Pad area and the SVE-treated area. The homogeneity of the Southern Concrete Pad area is assumed because all contaminated soils which can be practicably removed will be excavated. The SVE-treated area will be a homogeneous area assuming that the in-situ soils treatment method used to remove volatiles from the existing contaminated soils and the

overburden soils will yield effective and homogeneous results over depth and space.

Determination of the sample size for the two distinct areas are treated separately. The table in Attachment A-1.1 shows the sample sizes necessary to meet a range of prespecified coverages and a range of prespecified confidence levels.

For the SVE-treated area, a sample size of 29 was determined to be appropriate. This sample size corresponds to a 95% confidence limit in the 90th quantile. In other words, to be 95% confident that the maximum sample contaminant concentration is greater than the 90th quantile requires a sample size of 29. Therefore, 29 random, equidistant soil samples will be collected from the SVE-treated area. The first sample will be collected at a randomly selected start point. The remaining samples consist of equally spaced samples with varying X, Y, and Z (depth) coordinates.

In the Southern Concrete Pad area, it is assumed the majority of the contaminated soils will be excavated and placed in the SVE area for treatment. Field instruments will be utilized to identify additional excavation areas if necessary and feasible. Because remaining soil concentrations are expected to be at or near background levels, a lower level of confidence is necessary. A sample size of 15 was determined to be appropriate. This sample size corresponds to a 90% confidence limit in the 85th quantile. The sample size is inclusive of both the base of excavation and sidewall samples.

Sampling Plan

A systematic sampling plan with a random starting point will be used to determine the location of the cleanup verification samples. Soil sample locations for the Southern Concrete Pad area will be identified by X and Y coordinates within a 2-dimensional grid

system. Locations for the northern SVE-treated area will be identified by X, Y, and Z (depth) coordinates within a 3-dimensional grid system.

For the Southern Concrete Pad area, the distance between sampling locations, L, will be determined using the following equation:

$$L = (A / n)^{0.5} \quad \text{where } A = \text{sample area, } n = \text{sample size}$$

Based on the current estimated Southern Concrete Pad excavation area (approx. 35,000 square feet), the distance between sampling locations, L, was calculated to be 48 feet.

For the Northern SVE-treated area, the distance between sampling locations, L, will be determined using the same equation as for the Southern Concrete Area. Based on the current estimated SVE-treatment area of 115,400 square feet, the distance between sampling locations, L, was calculated to be 63 feet. One sample will be collected at each grid point, each with a random sample depth.

An example sampling grid system for the Southern Concrete Pad area and the Northern SVE treatment area is shown in Figure A-1.1. The sample locations shown on Figure A-1.1 are approximate locations based on current estimated soil areas and volumes. Actual sampling locations may vary based on field conditions and the actual volume of soil excavated during the Remedial Action.

Attachment A-1.1

MAX of N¹

Sample Allocation. The Max of N method to determine sample size is based on randomized collection of samples within defined areas of relatively homogeneous contamination. The number of samples within any homogeneous area is independent of the size of the area and has been based upon a nonparametric (distribution-free) statistical method which calculates the size of a sample (N) required to estimate a prespecified tolerance interval of the sampled population with a prespecified level of confidence (Practical Nonparametric Statistics, W.J. Conover. John Wiley, 1980).

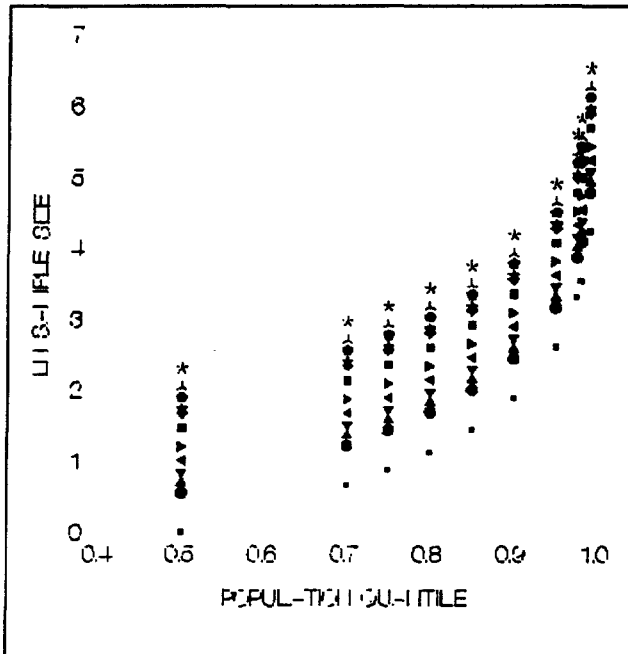
Nonparametric specification of sample size makes no assumptions about the underlying distribution of the chemical or compound. It does require specification of both a desired level of confidence and a desired upper bound on the quantile (of the sampled population) being estimated. The level of confidence reflects the probability that the maximum concentration from a sample of a given size will exceed the prespecified upper quantile and is preselected. The "Q"-th quantile of the population being sampled is the pre-selected proportion of the population being estimated (where Q ranges between 0 and 1). For example, half of the population is greater and half of the distribution is less than the .5 quantile, the population median value. The upper and lower quartiles of the distribution, the .75 and .25 quantiles, respectively, are the concentration levels at which 25% and 75% of the population are greater.

A prespecified confidence level of 95% and prespecified .5 quantile means that the maximum concentration from the sample of size "N" will not be less than the median (due to chance alone) more than 5 times out of 100 or will be greater than the median 95 times out of 100. "N" increases as either the preselected quantile (upper tolerance limit) or preselected level of confidence increases. The effect of raising the quantile of interest dominates the increase in required sample size. For example, to be 90% certain that the maximum concentration from a sample exceeds the median of the population being sampled requires a sample size of 4; to be 95% certain requires a sample size of 5--a comparatively negligible increase in sample size. To be 90% confident that the maximum sample concentration is greater than the .95 quantile requires a sample size of 45; to be 95% confident requires an N of 59.

The following tabulates sample sizes to meet a range of prespecified coverages and a range of prespecified confidence levels.

ESTIMATED QUANTILE	85% CONFIDENCE	90% CONFIDENCE	95% CONFIDENCE
50th [Median]	3	4	<u>5</u>
75th [Upper Quartile]	7	9	11
85th	12	15	19
90th	19	22	29
95th	37	45	59

The tabulated values are a useful subset of the following plot which exhibits the relative influence of increased coverage and increased confidence on sample size:



The x-axis is the quantile desired and the y-axis is the natural log transform of the required sample size for twelve 1-alpha levels: 0.5 (■), 0.70 (●), 0.75 (▲), 0.80 (▼), 0.85 (◁), 0.9 (▷), 0.95 (■), 0.975 (◆), 0.98 (★), 0.99 (⏟), 0.995 (⊥) and 0.999 (*), or, for alphas ranging between 0.001 and 0.50. Increase in sample size due to increasing desired confidence levels for any set quantile is seen by comparing heights of the 12 lines at any x-value. Perhaps more interesting, are the substantial increases in required sample sizes as we expand the proportion of the population we want to estimate, seen by tracking a single alpha-value line across the entire range of population quantiles.

Differential coverage of areas of concern over a site is best allocated on the basis of the conceptual model of site contamination. In general, a sample size of 5 will provide a high-confidence best estimate of the potential for contamination in a given area. Greater coverage may be specified for areas within the site about which information is limited or for areas which, based upon waste disposal practices, are expected to evidence greater variability in either the number or type of contaminants or the range of contaminant levels. In sampling reference areas, comparatively high coverage is advantageous, particularly if comparison to reference is the first step in identification of contaminants of concern.

Sample Locations. The only strong assumption implicit to the Max of N methodology is that sampling is randomized. Randomization (which is not synonymous with arbitrary) means that any location carries an equal probability of being sampled and that sampled locations are randomly assigned. It is an insurance policy against potential bias in results due to unknown processes. While an essential component to a sampling strategy, complete randomization is not necessarily the most efficient way to assign sample locations. A useful constraint to randomization in environmental situations where spatial coverage is of interest is to systematically sample from a randomized start point. This means that the all points in the area to be characterized carry equal probability of being sampled but that the entire area is uniformly sampled. Examples include gridding an area with randomized start-point and grid orientation. Application of the strategy in an area which is linear would consist of equispaced samples collected along a transect, with the first sample collected at a randomly selected start point.

¹ Practical Nonparametric Statistics, 2nd Edition, W.J. Conover, John Wiley and Sons, 1980.

Attachment A-2
Surface Water
Background Concentration Determination
Mass Balance Equations

Compliance Determination

$$Q_{sw2}^t C_{sw2}^t \leq \{Q_{sw2}^t \times [ASC]\} \text{ or } \{M_{BG}^t\}$$

$$C_{sw2}^t \leq \text{the greater of the following values: } [ASC] \text{ or } \left[\frac{M_{BG}^t}{Q_{sw2}^t} \right] \quad \text{Equation 1}^1$$

Determination of Background (M_{BG}^t)

$$M_{BG}^t = M_{sw1}^t + M_{NSL}^t \quad \text{Equation 2}$$

Where:

$$M_{sw1}^t = Q_{sw1}^t \bar{C}_{sw1}$$

$$M_{NSL}^t = Q_{NSL}^t \bar{C}_{NSL}$$

Description of Terms

C_{sw2}^t	=	Concentration of a given compound at sampling time = t; location = SW-2.
Q_{sw2}^t	=	Volumetric flow rate of Unnamed Ditch at sampling time = t; location = SW-2.
M_{BG}^t	=	Estimated mass contribution of a given compound from background at sampling time = t.
ASC	=	Acceptable Stream Concentration as defined in Table 3-1 of Exhibit A.
M_{sw2}^t	=	Mass of a given compound at sampling time = t; location = SW-2.
M_{sw1}^t	=	Estimated mass of a given compound at sampling time = t; location = SW-1.
Q_{sw1}^t	=	Volumetric flow rate of Unnamed Ditch at sampling time = t; location = SW-1.
\bar{C}_{sw1}	=	Applicable background concentration at SW-1, statistically calculated as two standard deviations above the mean of the 12 background samples.

¹ Prior to this document, Equation 1 would be represented as

$C_{sw2}^t \leq \text{the greater of the following values: } [ASC] \text{ or } [C_{sw1}^t]$. The term $\left[\frac{M_{BG}^t}{Q_{sw2}^t} \right]$ accounts for additional contribution from the NSL Channel.

- M'_{NSL} = Estimated mass of a given compound at sampling time = t; location = NSL-1.
- Q'_{NSL} = Flow contribution from Northside Sanitary Landfill estimated based on the relationship established with rainfall intensity.
- \bar{C}_{NSL} = Applicable background concentration at NSL-1, statistically calculated as two standard deviations above the mean of the 12 background samples.

Appendix B
Special Analytical Services (SAS)

5/016-6/96

U.S. Environmental Protection Agency Region V
SFD/Contracts Mgmt. Section
77 West Jackson, SM-5J
Chicago, Illinois 60604
PHONE: (312) 886-1488 FAX: (312) 886-0753

SAS Number
VOCs In Soil SAS

SPECIAL ANALYTICAL SERVICES
Client Request

[X] Regional Transmittal

A. EPA Region/Client: Region V
B. RSCC Representative: C. Luckett Acting Technical Project Manager (TPO): C. Luckett
C. Telephone Number: (312) 886-1488 (312) 886-1488
D. Date of Request: March 19, 1998
E. Site Name: Environmental Conservation and Chemical Corporation (ECC) Site

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delays in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. **General description of analytical service requested:**

Analysis of volatile organic compounds (VOCs) in soil samples. The concentration of VOCs will be analyzed in soil samples by gas chromatography/mass spectrometry (GC/MS). Sample results will be reported as $\mu\text{g}/\text{kg}$.

2. **Definition and number of work units involved (specify whether whole samples or fractions; whether aqueous or soil and sediments; and whether low, medium, or high concentration):**

Analysis of approximately 69 soil samples plus QA/QC samples (duplicates and MS/MSD). All samples are low concentration soil samples.

3. **Purposes of analysis (specify whether Superfund [Remedial or Enforcement], RCRA, NPDES, etc.):**

Superfund-Remedial

4. **Estimated date(s) of collection:**

Estimated April 1998 through December 2000

5. **Estimated date(s) and method of shipment:**

Method of shipment will be by overnight carrier.

6. **Number of days analysis and data required after laboratory receipt of samples:**

The laboratory will be required to provide results within 21 days of receipt of samples.

7. **Analytical protocol required (attach copy if other than a protocol currently used in this program):**

Analytical protocol taken from SW846 Method 8260.

Samples will be stored at 4 C until analysis and validation of results.

Note: Laboratory data rejection and non-payment will be recommended if methods other than those specified in this document are used.

*This method
was changed
from SW846-8240
to SW846-8260.
The # of samples
was also changed.*

5/016-6/96

8. **Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):**

Follow protocol according to the SW846 Method 8260. The initial calibration curve shall have five different levels of standards. The linearity of the initial calibration must be less than 35 percent RSD and RRF greater than 0.05. The low standard should be a concentration at or near the reporting limit. The laboratory should use the nearest internal standard when determining the response factor. Dilute samples with sample concentrations greater than the highest standard. The holding time shall not exceed 14 days from sample collection.

9. **Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain of Custody documentation, etc.). If not completed, format of results will be left to program discretion.**

The laboratory shall perform data reduction and shall report sample analysis data and quality control information as designated in the SW846 Method 8260. The sample analysis data package shall include all documentation, data reporting forms and raw data similar to that specified in CLP SOW.

All procedures used shall be clearly identified. All original raw data, forms, calculation worksheets, instrument read-outs, preparation forms, internal sample and/or extract chain of custody forms, strip charts and copies of pages from preparation and analysis logbooks shall be submitted. If originals were submitted in another data package, photocopies may be submitted with a record of the location of the originals.

All records of analysis and calculations shall be legible and be sufficient to recalculate all sample concentrations and QA audit results. QC reference samples or initial calibration standards shall be identified as to source, lot number and sample number.

Results will be reported in $\mu\text{g}/\text{kg}$.

10. **Other (use additional sheets or attach supplementary information, as needed):**

The laboratory is to conduct matrix spike and matrix spike duplicate (MS/MSD) analyses and report the results on the appropriate form.

The laboratory should provide a summary of their most recent MDL study using those protocols. The laboratory shall adhere to chain-of-custody and document control procedures described in the CLP SOW, 10/91.

All original sample tags, chain of custody forms, SAS packing lists, airbills and any other original receiving or transmittal forms or copies of receiving logbook pages pertaining to this SAS shall be submitted to the Region within the time frame listed in section 6 above. Photocopies may be submitted with a record of the location of the originals.

Payment to laboratories for this SAS analysis may be reduced if all procedures noted above are not followed and all required deliverables noted above are not supplied. The Region or its contractors shall not be charged further for the provision of required deliverables within this agreement.

11. **Name of sampling/shipping contact and phone number:**
David Shekoski (414)272-2426

I. **DATA REQUIREMENTS**

5/016-6/96

Parameter	Detection Limit ($\mu\text{g/kg}$)	Precision Desired
Acetone	10	± 35 percent
1,1-Dichloroethene	5	
1,2-Dichloroethene(total)	10	
Ethylbenzene	5	
Methylene Chloride	10	
Methyl Ethyl Ketone	10	
Methyl Isobutyl Ketone	15	
Tetrachloroethene	5	
Toluene	5	
1,1,1-Trichloroethane	5	
1,1,2-Trichloroethane	5	
Trichloroethene	5	
Vinyl Chloride	5	
Total Xylenes	5	

Note: These are minimum requirements. Report actual detection limit(s) used, based on allowable methodology options.

II. QC REQUIREMENTS

As required by the SW846 Method 8260.

<u>Audit</u>	<u>Frequency of Audits</u>	<u>Limits</u>
<u>Method Blank</u>	<u>at least one per group of 20 or fewer samples</u>	<u>concentration < detection limit</u>
<u>Laboratory control sample</u>	<u>at least one per group of 20 or fewer samples</u>	<u>% recovery within historical acceptance limits</u>
<u>MS/MSD</u>	<u>at least one per group of 20 or fewer samples</u>	<u>% recovery within historical acceptance limits</u>
<u>Surrogate spiking compounds</u>	<u>surrogates spiked into all samples (incl. QC samples)</u>	<u>% recoveries must be in control</u>
<u>Internal standard compounds</u>	<u>compounds spiked into all samples (incl. QC samples)</u>	<u>areas -50 to +100% from the last daily calibration check standard</u>

III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

Take corrective action. Contact the Region for problems that might result in the delay of reporting sample results.

5/016-6/96

U.S. Environmental Protection Agency Region V
SFD/Contracts Mgmt. Section
77 West Jackson, SM-5J
Chicago, Illinois 60604
PHONE: (312) 886-1488 FAX: (312) 886-0753

SAS Number Chromium VI SAS.
--

SPECIAL ANALYTICAL SERVICES
Client Request

[X] Regional Transmittal

A. EPA Region/Client: Region V

B. RSCC Representative: C. Lockett

Acting Technical Project Manager (TPO): C. Lockett

C. Telephone Number: (312) 886-1488

(312) 886-1488

D. Date of Request: April 7, 1997

E. Site Name: Environmental Conservation and Chemical Corporation (ECC) Site

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delays in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested:

Analysis of hexavalent chromium (Cr+6) in water samples. The laboratory will follow SW846 Method 7195 or 7197. Sample results will be reported in µg/L

2. Definition and number of work units involved (specify whether whole samples or fractions; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

Analysis of water samples plus QA/QC samples (field duplicates and blanks). All samples are low concentration water samples.

3. Purposes of analysis (specify whether Superfund [Remedial or Enforcement], RCRA, NPDES, etc.):

Superfund-Remedial

4. Estimated date(s) of collection:

1997 to 2005

5. Estimated date(s) and method of shipment:

Method of shipment will be by overnight carrier.

6. Number of days analysis and data required after laboratory receipt of samples:

The laboratory will be required to provide results within 21 days of receipt of samples.

7. Analytical protocol required (attach copy if other than a protocol currently used in this program):

Analysis according to the SW846 Method 7195 or 7197.

Samples will be stored at 4 C until analysis and validation of results.

Note: Laboratory data rejection and non-payment will be recommended if methods other than those specified in this document are used.

5/016-6/96

8. **Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):**

Follow protocol according to the SW846 Method 7195 or 7197. Dilute samples with sample concentrations greater than the highest standard. Samples shall be analyzed within 24 hours of sample collection.

9. **Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain of Custody documentation, etc.). If not completed, format of results will be left to program discretion.**

The laboratory shall perform data reduction and shall report sample analysis data and quality control information as designated in the SW846 Method 7195 or 7197. The sample analysis data package shall include all documentation, data reporting forms and raw data similar to that specified in CLP SOW.

All procedures used shall be clearly identified. All original raw data, forms, calculation worksheets, instrument read-outs, preparation forms, internal sample and/or extract chain of custody forms, strip charts and copies of pages from preparation and analysis logbooks shall be submitted. If originals were submitted in another data package, photocopies may be submitted with a record of the location of the originals.

All records of analysis and calculations shall be legible and be sufficient to recalculate all sample concentrations and QA audit results. QC reference samples or initial calibration standards shall be identified as to source, lot number and sample number.

Results will be reported in µg/L.

10. **Other (use additional sheets or attach supplementary information, as needed):**

The laboratory should provide a summary of their most recent MDL study using those protocols. The laboratory shall adhere to chain-of-custody and document control procedures described in the CLP SOW, 10/91.

All original sample tags, chain of custody forms, SAS packing lists, airbills and any other original receiving or transmittal forms or copies of receiving logbook pages pertaining to this SAS shall be submitted to the Region within the time frame listed in section 6 above. Photocopies may be submitted with a record of the location of the originals.

Payment to laboratories for this SAS analysis may be reduced if all procedures noted above are not followed and all required deliverables noted above are not supplied. The Region or its contractors shall not be charged further for the provision of required deliverables within this agreement.

11. **Name of sampling/shipping contact and phone number:**
David Shekoski (414)272-2426

I. DATA REQUIREMENTS

Parameter	Detection Limit	Precision Desired
	(µg/L)	
<u>Chromium VI (Cr+6)</u>	<u>10</u>	± 35 percent

Note: These are minimum requirements. Report actual detection limit(s) used, based on allowable methodology options.

II. QC REQUIREMENTS

5/016-6/96

As required by the SW846 Method 7195 or 7197.

<u>Audit</u>	<u>Frequency of Audits</u>	<u>Limits</u>
<u>Method Blank</u>	<u>at least one per group of 20 or fewer samples</u>	<u>concentration < detection limit</u>
<u>Laboratory control sample</u>	<u>at least one per group of 20 or fewer samples</u>	<u>+/- 15% recovery</u>
<u>Matrix Spike</u>	<u>at least one per group of 20 or fewer samples</u>	<u>75-125% recovery</u>
<u>Laboratory duplicate</u>	<u>surrogates spiked into all samples (incl. QC samples)</u>	<u><20 % RPD</u>

III. **ACTION REQUIRED IF LIMITS ARE EXCEEDED:**

Take corrective action. Contact the Region for problems that might result in the delay of reporting sample results.

5/016-6/96

U.S. Environmental Protection Agency Region V
SFD/Contracts Mgmt. Section
77 West Jackson, SM-5J
Chicago, Illinois 60604
PHONE: (312) 886-1488 FAX: (312) 886-0753

SAS Number As & Sb SAS

SPECIAL ANALYTICAL SERVICES
Client Request

[X] Regional Transmittal

A. EPA Region/Client: Region V
B. RSCC Representative: C. Luckett Acting Technical Project Manager (TPO): C. Luckett
C. Telephone Number: (312) 886-1488 (312) 886-1488
D. Date of Request: April 7, 1997
E. Site Name: Environmental Conservation and Chemical Corporation (ECC) Site

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delays in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested:

Analysis of arsenic and antimony in water samples. The laboratory will follow U.S. EPA Method 200.8. Sample results will be reported in µg/L

2. Definition and number of work units involved (specify whether whole samples or fractions; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

Analysis of water samples plus QA/QC samples (field duplicates and blanks). All samples are low concentration water samples.

3. Purposes of analysis (specify whether Superfund [Remedial or Enforcement], RCRA, NPDES, etc.):

Superfund-Remedial

4. Estimated date(s) of collection:

1997 to 2005

5. Estimated date(s) and method of shipment:

Method of shipment will be by overnight carrier.

6. Number of days analysis and data required after laboratory receipt of samples:

The laboratory will be required to provide results within 21 days of receipt of samples.

7. Analytical protocol required (attach copy if other than a protocol currently used in this program):

Analysis according to the U.S. EPA Method 200.8.

Samples will be preserved in the field with HNO₃ to pH<2, and stored at 4 C until analysis and validation of results.

Note: Laboratory data rejection and non-payment will be recommended if methods other than those specified in this document are used.

5/016-6/96

8. **Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):**

Follow protocol according to the U.S. EPA Method 200.8. Dilute samples with sample concentrations greater than the highest standard.

9. **Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain of Custody documentation, etc.). If not completed, format of results will be left to program discretion.**

The laboratory shall perform data reduction and shall report sample analysis data and quality control information as designated in the U.S. EPA Method 200.8. The sample analysis data package shall include all documentation, data reporting forms and raw data similar to that specified in CLP SOW.

All procedures used shall be clearly identified. All original raw data, forms, calculation worksheets, instrument read-outs, preparation forms, internal sample and/or extract chain of custody forms, strip charts and copies of pages from preparation and analysis logbooks shall be submitted. If originals were submitted in another data package, photocopies may be submitted with a record of the location of the originals.

All records of analysis and calculations shall be legible and be sufficient to recalculate all sample concentrations and QA audit results. QC reference samples or initial calibration standards shall be identified as to source, lot number and sample number.

Results will be reported in µg/L.

10. **Other (use additional sheets or attach supplementary information, as needed):**

The laboratory should provide a summary of their most recent MDL study using those protocols. The laboratory shall adhere to chain-of-custody and document control procedures described in the CLP SOW, 10/91.

All original sample tags, chain of custody forms, SAS packing lists, airbills and any other original receiving or transmittal forms or copies of receiving logbook pages pertaining to this SAS shall be submitted to the Region within the time frame listed in section 6 above. Photocopies may be submitted with a record of the location of the originals.

Payment to laboratories for this SAS analysis may be reduced if all procedures noted above are not followed and all required deliverables noted above are not supplied. The Region or its contractors shall not be charged further for the provision of required deliverables within this agreement.

11. **Name of sampling/shipping contact and phone number:**
David Shekoski (414)272-2426

I. **DATA REQUIREMENTS**

Parameter	Detection Limit (µg/L)	Precision Desired
Arsenic	0.0175	± 35 percent
Antimony	0.2	

Note: These are minimum requirements. Report actual detection limit(s) used, based on allowable methodology options.

II. **QC REQUIREMENTS**

5/016-6/96

As required by the U.S. EPA Method 200.8.

<u>Audit</u>	<u>Frequency of Audits</u>	<u>Limits</u>
<u>Method Blank</u>	<u>at least one per group of 20 or fewer samples</u>	<u>concentration < detection limit</u>
<u>Laboratory control sample</u>	<u>at least one per group of 20 or fewer samples</u>	<u>+/- 20% recovery</u>
<u>Matrix Spike</u>	<u>at least one per group of 20 or fewer samples</u>	<u>80-120% recovery</u>
<u>Matrix Spike Duplicate</u>	<u>at least one per group of 20 or fewer samples</u>	<u>80-120% recovery; <20% RPD</u>
<u>Serial Dilution</u>	<u>at least one per group of 20 or fewer samples</u>	<u>10 % Difference</u>

III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

Take corrective action. Contact the Region for problems that might result in the delay of reporting sample results.

5/016-6/96

U.S. Environmental Protection Agency Region V
SFD/Contracts Mgmt. Section
77 West Jackson, SM-5J
Chicago, Illinois 60604
PHONE: (312) 886-1488 FAX: (312) 886-0753

SAS Number Tin SAS

SPECIAL ANALYTICAL SERVICES
Client Request

[X] Regional Transmittal

A. EPA Region/Client: Region V
B. RSCC Representative: C. Luckett Acting Technical Project Manager (TPO): C. Luckett
C. Telephone Number: (312) 886-1488 (312) 886-1488
D. Date of Request: April 7, 1997
E. Site Name: Environmental Conservation and Chemical Corporation (ECC) Site

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delays in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested:

Analysis of tin in water samples. The laboratory will follow SW846 Method 6010. Sample results will be reported in $\mu\text{g/L}$

2. Definition and number of work units involved (specify whether whole samples or fractions; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

Analysis of water samples plus QA/QC samples (field duplicates and blanks). All samples are low concentration water samples.

3. Purposes of analysis (specify whether Superfund [Remedial or Enforcement], RCRA, NPDES, etc.):

Superfund-Remedial

4. Estimated date(s) of collection:

1997 to 2005

5. Estimated date(s) and method of shipment:

Method of shipment will be by overnight carrier.

6. Number of days analysis and data required after laboratory receipt of samples:

The laboratory will be required to provide results within 21 days of receipt of samples.

7. Analytical protocol required (attach copy if other than a protocol currently used in this program):

Analysis according to the SW846 Method 6010 Series.

Samples will be preserved in the field with HNO_3 to $\text{pH} < 2$, and stored at 4 C until analysis and validation of results.

Note: Laboratory data rejection and non-payment will be recommended if methods other than those specified in this document are used.

5/016-6/96

8. **Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):**

Follow protocol according to the SW846 Method 6010 Series. Dilute samples with sample concentrations greater than the highest standard.

9. **Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain of Custody documentation, etc.). If not completed, format of results will be left to program discretion.**

The laboratory shall perform data reduction and shall report sample analysis data and quality control information as designated in the SW846 Method 6010 Series. The sample analysis data package shall include all documentation, data reporting forms and raw data similar to that specified in CLP SOW.

All procedures used shall be clearly identified. All original raw data, forms, calculation worksheets, instrument read-outs, preparation forms, internal sample and/or extract chain of custody forms, strip charts and copies of pages from preparation and analysis logbooks shall be submitted. If originals were submitted in another data package, photocopies may be submitted with a record of the location of the originals.

All records of analysis and calculations shall be legible and be sufficient to recalculate all sample concentrations and QA audit results. QC reference samples or initial calibration standards shall be identified as to source, lot number and sample number.

Results will be reported in µg/L.

10. **Other (use additional sheets or attach supplementary information, as needed):**

The laboratory should provide a summary of their most recent MDL study using those protocols. The laboratory shall adhere to chain-of-custody and document control procedures described in the CLP SOW, 10/91.

All original sample tags, chain of custody forms, SAS packing lists, airbills and any other original receiving or transmittal forms or copies of receiving logbook pages pertaining to this SAS shall be submitted to the Region within the time frame listed in section 6 above. Photocopies may be submitted with a record of the location of the originals.

Payment to laboratories for this SAS analysis may be reduced if all procedures noted above are not followed and all required deliverables noted above are not supplied. The Region or its contractors shall not be charged further for the provision of required deliverables within this agreement.

11. **Name of sampling/shipping contact and phone number:**
David Shekoski (414)272-2426

I. DATA REQUIREMENTS

Parameter	Detection Limit	Precision Desired
<u>Tin</u>	<u>µg/L</u> <u>200</u>	<u>± 35 percent</u>

Note: These are minimum requirements. Report actual detection limit(s) used, based on allowable methodology options.

II. QC REQUIREMENTS

As required by the SW846 Method 6010 Series.

5/016-6/96

<u>Audit</u>	<u>Frequency of Audits</u>	<u>Limits</u>
<u>Method Blank</u>	<u>at least one per group of 20 or fewer samples</u>	<u>concentration < detection limit</u>
<u>Laboratory control sample</u>	<u>at least one per group of 20 or fewer samples</u>	<u>+/- 20% recovery</u>
<u>Matrix Spike</u>	<u>at least one per group of 20 or fewer samples</u>	<u>80-120% recovery</u>
<u>Matrix Spike Duplicate</u>	<u>at least one per group of 20 or fewer samples</u>	<u>80-120% recovery; <20% RPD</u>
<u>Serial Dilution</u>	<u>at least one per group of 20 or fewer samples</u>	<u>10 % Difference</u>

III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

Take corrective action. Contact the Region for problems that might result in the delay of reporting sample results.

Appendix C

Sample Shipment Documentation

APPENDIX C

Sample Shipment Documentation

Sample Documentation

Sample Identification System

A sample numbering system devised by the ECC Trusts consultant will be slightly modified and used to identify each sample, including duplicates and blanks. The sample designation system can be found in Section 4 of Appendix A. A list of sample identification numbers will be maintained in the field logbook by the field activity manager.

Sample Documentation Instructions

Sample Tag (Figure 1)

1. Enter date of sampling.
2. Enter time of sampling (military time only).
3. Specify "grab" or "composite" sample with an "X."
4. Enter CH2M HILL sample identification code.
5. Obtain signature of sample team leader.
6. Indicate preservative used (if any) with an "X."
7. Specify all parameters for analysis by placing an "X" to the right of each one.
8. Indicate the sample number. For analysis through the CLP, record the number from the stick-on labels. For SAS analyses through a contractor-procured laboratory, record the unique CH2M HILL sample number.
9. Indicate cash number (e.g., Case No. 1234).
10. Leave BLANK (for laboratory use only).
11. Enter any desired analyses not listed on menu (e.g., PCBs, ammonia, sulfide, etc.) and mark box with an "X."

Combined Chain-of-Custody and Traffic Report Forms for SAS (Figure 3)

1. Project Code: Leave Blank.
2. Account Code: Leave Blank.

Figure 3

EVIDENCE RECEIPT					
Requested by: (Signature)	Date/Time	Received by: (Signature)			
Requested by: (Signature)	Date/Time	Received by: (Signature)			
Requested by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks Is custody seal intact? <input type="checkbox"/> Yes <input type="checkbox"/> None	

SEE REVERSE FOR ADDITIONAL STANDARDS INSTRUCTIONS
SEE REVERSE FOR PURPOSE CODE DEFINITIONS

3. Regional Information: If sampling is in support of oversight activities, indicate here. If this is an enforcement site, record "TGB102." If not, record "TFA102."
4. Non-Superfund Program: If sampling is not done under the Superfund program, enter the name of the program (e.g., RCRA).
5. Site Name, City, State: Complete as instructed.
6. Site Spill ID: Enter ID code provided by the office.
7. Region No.: Enter "Region 5."
8. Sampling Company: Enter "CH2M HILL."
9. Sampler Information: Complete as instructed.
10. Type of Activity:
 - SF—Superfund lead
 - PRP—PRP lead
 - ST—State lead
 - FED—Federal lead
 - PA—Preliminary assessment
 - SSI—Screening site investigation
 - LSI—Listing site investigation
 - RIFS—Remedial Investigation/Feasibility Study
 - RD—Remedial design
 - O&M—Operation & Maintenance
 - NPLD—National Priorities List delete
 - CLEM—Classic emergency
 - REMA—Removal assessment
 - REM—Removal
 - OIL—Oil response
 - UST—Underground storage tank response
11. Shipping Information: Complete as instructed.
12. Ship To: Enter laboratory name, address, and sample recipient/custodian.
13. Case No.: Complete as instructed.
14. Sample Numbers: For routine organic/inorganic samples, enter the CLP numbers from the "stick-on" labels. For SAS samples shipped to a CH2M HILL-procured laboratory, enter the unique CH2M HILL-generated sample number.
15. Sample Information: Complete as instructed.
16. Regional Specific Tracking Number or Tag Number: Enter sample tag number(s).
17. Station Location Number: Enter sample identifier (as defined in the QAPjP).
18. Rime/Date: Complete as instructed. Use military time.

19. Sampler Initials: OPTIONAL.
20. Corresponding CLP Organic/Inorganic Sample Number: Enter CLP sample number (from "stick-on" labels) of corresponding sample from same location. Not applicable to SAS forms.
21. Designated Field QC: Indicate QC status when applicable (field blanks, trip blanks, duplicates, MS/MSD, etc.)
22. Sampling Status: Is the sampling for this Case/SAS complete? Circle one.
23. Page 1 of ____: Record number of documents enclosed in cooler.
24. MS/MSD and/or Duplicate: List samples.
25. Additional Samplers Signatures: OPTIONAL.
26. Chain-of-Custody Seal No.: Enter the numbers that appear on the custody seals to be used to seal the cooler (there should be two).
27. "Relinquished by" and "time/Date": Complete as instructed. Use military time.

Distribution: For RAS, the Laboratory Copy and laboratory Copy for Return to SMO are included with the shipment. The Region Copy and SMO Copy are returned to the office. For SAS, the Laboratory Copy for Return to Region and Laboratory Copy for Return to Data User are included with the shipment. The Region Copy and Data User Copy are returned to the office.

Notice of Transmittal (Figure 4)

1. Enter the name of team leader.
2. Enter team leader's firm name.
3. Enter CH2M HILL project number.
4. Enter case number.
5. Enter date.
6. Enter number of samples shipped.
7. Enter matrix of samples.
8. Enter the site name in words.
9. Enter the location of the site (city, state).

Packaging and Shipping Procedures

Low-Concentration Samples

1. Prepare coolers for shipment.
 - Tape drains shut.
 - Affix "This Side Up" labels on all four sides and "Fragile" labels on at least two sides of each cooler.

Figure 4
Notice of Transmittal

Date:

To:

CH2M HILL
411 E. Wisconsin Avenue, Suite 1600
P.O. Box 2090
Milwaukee, WI 53201

Attn: Cherie Wilson

From:

_____/_____
(name) (firm)

CH2M HILL Project No.:

Enclosed are appropriate copies of the sample documentation forms completed under

Case No. _____ for the _____, 19__ shipment of _____ samples
(qty) (matrix)
from the _____ site located in _____.

- Place mailing label with laboratory address on top of coolers.
 - Fill bottom of coolers with about 3 inches of vermiculite or use preformed poly-foam liner.
 - Place appropriate traffic reports, SAS packing lists, or regional field sheets and chain-of-custody records with corresponding custody seals on top of each cooler.
2. Arrange decontaminated sample containers in groups by sample number.
 3. Mark volume levels on bottles with a grease pencil.
 4. Secure appropriate sample tags around lids of containers with string or wire.
 5. Secure container lids with strapping tape.
 6. Arrange containers in front of assigned coolers.
 7. Affix appropriate adhesive labels from assigned traffic report to each container. Protect with clear label protection tape.
 8. Seal each container within a separate plastic bag.
 9. Arrange containers in coolers so that they do not touch.
 10. If ice is required to preserve the samples, cubes should be repackaged in double zip-loc bags and placed on and around the containers (especially on VOA vials).
 11. Fill remaining spaces with vermiculite (or place poly-foam liner cover on top of samples).
 12. Sign chain-of-custody form (or obtain signature) and indicate the time and date it was relinquished to Federal Express.
 13. Separate copies of forms. Seal proper copies within a large zip-loc bag and tape to inside lid of cooler. Distribute remaining copies as indicated in the following sections.
 14. Close lid and latch.
 15. Carefully peel custody seals from backings and place intact over lid openings (right front and left back). Cover seals with clear protection tape (Figure 10).
 16. Tape cooler shut on both ends, making several complete revolutions with strapping tape. **Do not** cover custody seals (see Figure 10).
 17. Relinquish to Federal Express. Place airbill receipt inside the mailing envelope and send to the sample documentation coordinator along with the other documentation.

- Place mailing label with laboratory address on top of coolers.
 - Fill bottom of coolers with about 3 inches of vermiculite or use preformed poly-foam liner.
 - Place appropriate traffic reports, SAS packing lists, or regional field sheets and chain-of-custody records with corresponding custody seals on top of each cooler.
2. Arrange decontaminated sample containers in groups by sample number.
 3. Mark volume levels on bottles with a grease pencil.
 4. Secure appropriate sample tags around lids of containers with string or wire.
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This Appendix
was added
to include
new soil
VOC methods.

Appendix D
EPA Method 5035
Soil VOC Sample Collection

Soil Sampling SOP

EnCore (High or Low Level)

PreSampling

1. Ship one EnCore sampler per sample location

Note: If low level analyses are needed, two additional EnCore samplers will be required

Field Sampling

1. Remove sampler from package and attach handle
2. Quickly collect a 5 or 25 gram sample using the EnCore sampler.
3. Attach cap
4. Fill out label and attach to sampler.
5. Ship to lab.

Laboratory Analysis

1. Within 48 hours of sampling, transfer to tared vial containing methanol.
2. Record sample weight
3. Analyze according to high level method.

Note: If low level analyses are needed, the sample can be transferred to vials containing acid as per Method 5035.

Soil Sampling SOP

Method 5035—Low Level

NOTE: A High Level Sample (Field Methanol or EnCore) must also be collected.

PreSampling

1. 40 mL VOA vial
2. Add clean magnetic stir bar
3. Add 1 gram sodium bisulfate and 5 mL water
4. Attach label
5. Weigh to nearest 0.01 gram and record on label
6. Send duplicates vials to field for each sample point plus trip blank
7. Ship according to DOT regulations (CORROSIVE)

Field Sampling

1. Evaluate the soil type to determine if the acid solution will reduce the soil pH to < 2 .
2. Evaluate the soil type relative to effervescence due to carbonates in the soil.
3. Quickly collect a 5 gram sample using a cut off plastic syringe or other coring device.
4. Quickly transfer to VOA Vial and weigh to nearest 0.01 gram.
5. Record exact weight on label.
6. Collect duplicates for each sample location.
7. If needed, add more acid, and record weight
8. If effervescing, either a) cap, if in your judgment the effervescing is low, or b) collect a sample with no preservative.

Notes: The method indicates that vials may explode on shipping, and that effervescing could result in a loss of volatiles. If samples are collected with no headspace, they should be analyzed within 48 hours to prevent losses from biodegradation.

9. Ship to lab per DOT regulations (CORROSIVE.)

Laboratory Analysis

1. All analyses must be conducted using a new type of autosampler.
2. If the concentration exceeds the linear range ($>200 \mu\text{g/kg}$), high level analyses must be performed.

*Nominal concentration for GC/MS analyses. This value will change based on the analyte and laboratory method.

Soil Sampling SOP

Field Methanol Preservation (High Level)

PreSampling

1. 40 mL VOA vial
2. Add 5 mL methanol
3. Attach label
4. Weigh to nearest 0.01 gram and record on label
5. Ship according to DOT regulations (FLAMMABLE LIQUID, POISON.)

Field Sampling

1. Quickly collect a 5 gram sample using a cut off plastic syringe or other coring device.
2. Quickly transfer to VOA Vial
3. Ship to lab per DOT regulations (FLAMMABLE LIQUID, POISON.)

Laboratory Analysis

1. Weigh container to determine sample weight.
2. Based on screening results, analyze the appropriate amount of methanol

Note: The high level option in Method 5035 would require sample weights to be recorded in the field. The high level option in Method 5035 would require sample vials to be discarded if weights do not agree within 0.01 grams.